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Agricultural Graduates and Industry

Ever since the establishment of courses of training in agricultural science at Australian universities over twenty-five years ago, the small but steady stream of graduates in this subject has for the most part found its way into the portals of government institutions. That this has been so is evidenced by the figures presented in the table on the following page, and it will be seen that for all States the number of graduates employed by Federal, State, or overseas government bodies is far in excess of the numbers recorded under "Universities," "Commercial Institutions" and "Farming Pursuits." These facts have, in general, long been recognised, but the latest available totals make clear in bold relief the extent to which scientific method in agriculture has been appreciated and fostered by those charged with the responsibility of ministering to the solution of national problems in primary production. Indeed, the responsibility is and always will be one intimately bound up with governmental policy. At the same time there are other spheres which not only offer scope for rendering service to the nation, directly or indirectly, but which in themselves constitute an answer to the much-quoted dictum that an agricultural graduate can look to little more than a government job as a means of livelihood.

The early influx of graduates into State Departments was largely the result, in New South Wales at least, of the scientific trainee and education scholarship systems which offered financial inducements to approved persons to enter upon university studies with the prospects of permanent employ in the Public Service following graduation. In framing the curricula the professors had in mind particularly the special requirements of the Departments to be served by university trained men—but the courses of instruction have not been lacking in providing students with the necessary equipment for spheres other than in government departments, a fact evidenced by the good work which has and still is being performed by those engaged in various parts of Australia as advisory or field officers in estate, fertiliser and machinery firms; as technologists in

University of—	Total No. Agric. Graduates	Agric. Graduates engaged in or by—									
		Govt. Institutions		Universities		Commercial Institutions		Farming Pursuits		Miscell.*	
		No.	%	No.	%	No.	%	No.	%	No.	%
Sydney	119	87	73	8	7	10	8.5	5	4	9	7.5
Melbourne	118	75	63.5	5	4	16	13.5	8	7	14	12
West. Australia	43	29	67.5	1	2	2	5	6	14	5	11.5
Queensland	29	19	65.5	—	—	3	10.5	2	7	5	17
Adelaide	23	11	48	4	17.5	2	8.5	4	17.5	2	8.5

* Including graduates in non-agricultural professions, and those deceased or whose present occupations are unknown.

breweries and in dairy, tobacco and oil corporations; as entomologists or bacteriologists in gelatine and sugar companies; and as agricultural journalists on leading city newspapers. Even so—as represented in the foregoing table—the actual numbers employed by commercial bodies are comparatively small, but with continued realisation by industrial and commercial organisations of the need for well trained men to meet the ever-surging problems of production and distribution, and with appreciation of the value of agricultural graduates in particular, then the demand may be expected to be greater than at present.

As was stated in the report of the Advisory Council of the Department of Scientific and Industrial Research (England), a few years ago: "Scientific research has in the past made striking contributions to industrial progress and it will make them in the future. But the nation which will enjoy the benefits of science in the day-to-day progress of its industries is the nation which

habitually applies scientific method and scientific knowledge; and it is that nation which will be able to seize the more spectacular achievements of science in the industrial sphere." And there is ample demonstration that the university-trained agricultural man has an important contribution to make in this connection, if given the opportunity.

The Institute in its First Year*

by

A. J. Vasey, B.Agr.Sc.
Honorary Secretary.

By the time this issue of the Journal appears in print the Australian Institute of Agricultural Science will have been in existence almost a year, and it is the purpose of this article to review briefly the progress made in that time and to submit certain figures in regard to present membership.

In the period under review, six local branches have been formed and their membership totals to date (31st October, 1935) are as follows:

New South Wales	73	corporate members	
Victoria	62	,, ,,	and 12 student members.
South Australia	41	,, ,,	
Queensland	28	,, ,,	
F.C. Territory....	24	,, ,,	
Tasmania	17	,, ,,	

Total for Commonwealth 245 corporate members and 12 student members.

The extent of the support for the Institute in its first year, which these figures indicate, can only be regarded as extremely gratifying, and far exceeds the most optimistic estimates of the Delegates' Meeting of January last, particularly in regard to the smaller States. It is hoped that the Foundation Meeting of the Western Australian Branch will take place very shortly.

As is now well known, the relevant Article of the Constitution provides for admission to Corporate Membership under four headings, which are briefly:

Art. 5 Cl. (a) Section 1.—Graduates in Agricultural Science of an Australian or approved overseas University.

Section 2.—Full time members of the staff of the School of Agriculture of any Australian University.

Section 3.—Graduates in other faculties of an Australian or approved overseas University, engaged in approved agricultural work.

Section 4.—Specially approved non-graduates.

* Since the preparation of this manuscript the Western Australian Branch has been formed, and the corporate membership of the Institute is now considerably in excess of 245.—A.J.V., 1st Dec., 1935.

In the following Table the membership enrolments of the Branches are presented according to the section under which admission to membership was obtained, with the further segregation of Australian and overseas graduates under sections 1 and 3. Members of University staffs have been included under section 2 only when their qualifications would not gain them admission under 1 or 3.

	Section of Art. 5 Cl. (a) under which admitted:					
	1		2	3		4
Local Branch	Aust.	O'seas.		Aust.	O'seas.	
N.S.W.	55	—	2	2	3	11
Vic.	48	2	1	5	1	5
S.A.	21	—	—	12	3	5
Qld.	18	1	—	7	2	—
F.C.T.	9	2	—	8	4	1
Tas.	3	4	—	5	2	3
Section Totals ..	154	9	3	39	15	25
Percentage	62.9	3.7	1.2	15.9	6.1	10.2

Carrying the analysis still further, it is considered that the form of employment of members is of sufficient interest to be recorded separately:

	Employing Organisation.			
Local Branch.	Govt. Depts. (C'wealth & State)	Universities	Commercial Firms	Private
N.S.W.	52	5	10	6
Vic.	47	6	8	1
S.A.	16	20	1	4
Qld.	22	3	2	1
F.C.T.	24	—	—	—
Tas.	17	—	—	—
Totals	178	34	21	12

Under the heading of private employment are grouped those members engaged in farming and grazing and also some who have retired from the practice of the profession.

Finally, there are recorded in the next Table the particular specialties of Institute members. In this classification certain groupings are somewhat arbitrary, but it is felt that the figures present a fairly accurate picture of the breadth of interests united in this one Institute.

Specialty.	N.S.W.	Vic.	S.A.	Q.	F.C.T.	Tas.	Totals.
Administration	2	10	5	—	2	2	21
Agronomy....	—	7	4	2	—	7	20
Agrostology	4	4	2	—	2	1	13
Bacteriology	2	—	1	—	—	—	3
Botany....	1	1	—	—	1	—	3
Chemistry	9	7	8	1	1	1	27
Dairy Technology	—	4	1	1	—	1	7
Education (Univ.)	5	5	—	3	—	—	13
Education (Other)	13	5	4	—	—	—	22
Entomology	8	2	3	7	5	1	26
Farming and Grazing	4	—	1	—	—	—	5
Horticulture	3	6	1	1	—	2	13
Irrigation	—	1	—	—	—	—	1
Plant Breeding	5	1	1	3	6	—	16
Plant Pathology	9	4	1	7	4	1	26
Plant Physiology....	—	—	2	—	—	1	3
Prop. & Journalism....	6	4	1	2	—	—	13
Soil Survey	—	—	2	—	—	—	2
Statistics	—	—	—	—	1	—	1
Weed Control	—	—	—	—	2	—	2
Not specified	2	1	4	1	—	—	8
State totals....	73	62	41	28	24	17	245

The Brisbane Congress of the International Society of Sugar Cane Technologists

by

ARTHUR F. BELL, M.Sc.

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The International Society of Sugar Cane Technologists is an organisation unique among the scientific and technical societies of the world, inasmuch as it represents the only instance in which the technical resources and personnel of a complete industry are organised upon a world wide basis.

The Society was formed in Honolulu in 1924 at the conclusion of the deliberations of the sugar section of the Pan Pacific Food Congress, and a constitution providing for the holding of triennial international congresses was approved. Subsequent congresses have been held in Habana, Cuba (1927),

Soerabaja, Java (1929), San Juan, Puerto Rico (1932), and Brisbane (1935). The founders of the Society faced a cane sugar world of practically isolated units, with an inadequate and infrequent interchange of the results of research such as was characteristic of tropical agriculture generally. The personnel of the various experiment stations and research institutions were frequently unknown beyond the confines of their immediate political boundaries and co-ordinated effort was entirely lacking.

In the eleven years of its existence the Society has wrought a complete change in the structure and status of cane sugar technology. A free and widespread interchange of the publications of the various institutions has been effected, while two internationally circulating periodicals publish monthly synopses of all technical literature published under the auspices of the sugar cane and sugar beet industries. The most important of all, however, has been the facilitating of personal contacts of workers in allied fields of investigation. The membership of the Society (which till recently was limited to twenty-five per section) stands at some 550 persons, drawn from England, France, Egypt, South Africa, Mauritius, Reunion, India, Japan, Philippine Islands, Java, Australia, Fiji, Hawaii, United States, Cuba, Puerto Rico, British West Indies, French West Indies, Mexico, Guiana, Colombia, Argentina, and Peru. A delegate who has attended, say, two conferences has probably made the personal acquaintance of some two hundred technologists drawn from virtually every one of the countries listed above.

To facilitate discussion the Congresses are divided into five sections, viz.: Manufacture, Pathology, Entomology, Agriculture and Soils, and Cane Breeding and Varieties. Papers contributed by members are read and discussed in each section, the whole being bound in the Official Proceedings and distributed to members. Discussion by delegates, whether representing Government, private or semi-private institutions, has always been of the frankest possible nature. Special committees are formed as the occasion demands for the conduct of collateral investigations in different countries.

It will perhaps now be appreciated how far-reaching and how effective is the provision for the international pooling and collation of data resulting from the researches of the many laboratories and experimental stations maintained by this vast industry; and one may, perhaps, be pardoned a certain pride in the realisation that amidst the ever-increasing trend towards national isolation this industry can still maintain an international clearing house where the exchange of technical knowledge is possible without reference to political or geographic boundaries, colour, caste, or creed. As an interesting example of co-ordinated effort, it might be recalled that some years ago three members of the Society—a cane breeder from Java, a pathologist from the United States and an entomologist from Hawaii—made an aeroplane expedition to New Guinea in search of new varieties of cane.

The Brisbane congress was attended by delegates from twelve countries, and among them were a number of the leading technologists of the sugar world. The actual congress covered a period of a week, during which time some eighty-five papers were read and discussed by the five sections. In the agricultural section particular interest was evinced by overseas delegates in cultural methods, particularly in relation to the utilization of implements and labour-saving devices. Throughout the tropics the tendency is for the coloured man to demand an ever-increasing share in the returns for the fruits of his labour, and the disparity between the cost of white and coloured labour thus tends ever to decrease. All countries (with the exception of Java) are now looking towards mechanical cultivation as a method of reducing costs of production, and it was obvious to them that they must, in general, have much to learn from Australia, where labour costs are so high and the average price per ton for sugar now sensibly higher than in many countries. As one American delegate wrote: "As regards wages, there is no doubt about the fact that you are paying more than other countries are capable of paying, even when receiving prices for sugar equivalent to your present average prices."

A session was devoted to laboratory methods for the determination of soil fertility, an important avenue for exploration in the agriculture of sugar cane since the nature and bulk of the crop greatly enhance the difficulties of field experimentation. Highly satisfactory progress is being made along these lines, particularly by the use of the Mitscherlich pot tests and modified rapid chemical tests either in the field or in the laboratory. A symposium was devoted to methods of field experimentation but on this subject there appeared to be several schools of thought. Unquestionably the varying systems of harvesting and the varying mental equipment of the labour employed will continue to militate against the adoption of unified practice.

The pathologists paid particular attention to the development and testing of resistant varieties as a means of disease control; a measure which, due to the small farm system of agriculture, has received much more attention in Australia than elsewhere. That this subject is receiving greatly increased consideration is evidenced by the fact that more than half the papers presented dealt directly or indirectly with varietal resistance.

Joint sessions with the entomological section dealt with virus diseases and quarantine. A valuable and comprehensive survey of the present knowledge of the virus diseases of sugar cane was presented by Dr. E. W. Brandes and Dr. J. Matz, of the United States, while Mr. H. H. Storey, of Tanganyika, looked into the future and attempted to forecast the trend of cane virus disease research. The gradually increasing list of cane diseases for which have been demonstrated the existence of variable and selective strains of the causal organism, has given an added importance to the subject of quarantine. The papers and discussion presented amply justify the existing provision of quarantine facili-

ties in Australia, a matter which evoked some criticism on the plea that Australia already has virtually all the sugar cane diseases.

In the entomological sessions proper, principal interest revolved around biological control of pests by parasites or predators, and a good deal of attention was given to the promising trend of work in the West Indies where J. G. Myers preaches and practises entomological ecology. *Bufo marinus,* the Giant American Toad, which was introduced into Queensland last June, is obviously regarded with a good deal of affection by entomologists; incidentally the Queensland importation has furnished the first case of these animals breeding in captivity.

The cane breeding section was honoured by the presence of Dr. O. Posthumus, of Java, and Rao Bahadur T. S. Venkatraman, of India. The latter has lately achieved some remarkably interesting results by successfully crossing sugar cane and sorghum, with the object of producing early maturing cane. The present group of hybrids mature in 5-6 months (instead of 12-18 in the case of cane) but lack vigour. All hybrids were at first sterile but a number are now yielding fertile pollen so that back crosses to cane, to incorporate more vigour, will be watched with great interest.

The vexed question of seedling selection was the subject for a symposium, but perhaps the best that could be said at its conclusion was that cane breeders are probably not more at variance than are the breeders of most other crops.

At the conclusion of these meetings the delegates were taken by special train on a tour of the Queensland sugar belt; this tour lasted two weeks and embraced the districts of Bundaberg, Mackay, Burdekin, Ingham, Tully, Babinda, Cairns and Mossman. In order to minimise somewhat the predisposition towards technological indigestion, a number of detours were made and the visitors were enabled to gaze upon some of the scenic beauties of North Queensland, including the Hinchinbrook Channel, the Barron Falls and Barron Gorge, and the Barrier Reef; while a visit to the Yarrabah Mission afforded an opportunity to witness displays of spear and boomerang throwing as well as several corroborees.

Summarising the impressions formed by the delegates (which were freely sought), we were agreeably surprised to find that the status of our cane agriculture was viewed so favourably. Many of the delegates, knowing that Australia included most sugar cane diseases in its collection, were apparently under the impression that a course of symptomology could be given in any field selected at random; they were surprised (and some of them perhaps felt a little disappointed) to find that nowadays most of these diseases are relatively scarce and that a great many miles of dusty roads had to be traversed in order to observe them. The system of farm experimentation and its results were warmly commended, as also was the efficiency of the man unit of labour. Finally, the system of the control of the Bureau of Sugar Experiment Stations by an Advisory Board, which was adopted in Queensland some two years ago, was regarded as being highly satisfactory.

Agriculture in New Zealand, South America and South Africa

by

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Deputy Director of Agriculture, South Australia.

The following is the outline of an address given to members of the South Australian Branch of the Australian Institute of Agricultural Science at its third meeting, held at Adelaide on 27th September, 1935, and contains impressions gained by Mr. Spafford during his recent visit to exporting countries of the Southern Hemisphere.—Ed.

Australia can learn a great deal from New Zealand, particularly in regard to pasture development, pasture management and co-operative enterprise. New Zealand has been richly endowed by nature with fertile volcanic soils and a liberal, well-distributed rainfall, but more than this, she has by skilful and efficient management taken full advantage of her natural resources to develop what are probably the most productive pastures in the world. Cases are not infrequent in which as many as 8 to 10 large Romney Marsh or crossbred ewes have been carried and 120 per cent. of lambs fattened per acre of seeded pasture, and after the lambs were sold several "dry" sheep were fattened per acre. This has been attained very largely as a result of the complete and far-reaching manner in which technical knowledge and advice has been applied by the individual farmer. The use of certified pasture seeds and the establishment of proven seeds mixtures, the application where necessary of as much as 6 cwt. per acre of superphosphate and 10 cwt. per acre of lime annually, and the adoption of efficient, intensive grazing methods, have all played an important part in the attainment of pre-eminence in this field.

Co-operation is strikingly developed in the manufacture of dairy products, and the returns from dairying in comparison with the size of the country are remarkably high. This is reflected in the butter and cheese export figures—over 150,000 tons of butter, 110,000 tons of cheese, nearly 7,000 tons dried milk and casein and condensed milk in large quantities. The figures for exported meat are also striking—nearly nine million carcases of lamb and over two million carcases of mutton. The management of the grazing animals, like that of the pastures, is highly efficient.

One of the most successful and efficient enterprises adopted in comparatively recent years is the New Zealand scheme of seed certification. Little but certified seeds are now sown. The cost of manufacturing dairy products has

also been brought down considerably, and the manufacturing industries, which are nearly 100 per cent. co-operative, have become extraordinarily efficient.

The journey from Auckland, to the Panama Canal and down the west coast of South America to Valparaiso, in Chile, takes a long time, 45 days, but although not very interesting from an agricultural point of view is really attractive for tourists. Chile is a long, narrow strip of country 2,661 miles in length and approximately 100 miles wide, with a relatively primitive agriculture. Roughly a third is desert; the remainder ranges from no rain to country receiving 120 and 130 inches of annual rainfall, and where there is sufficient rainfall has Mediterranean type of climate, with winter rains and dry summers. Chile was of particular interest to South Australia from two points of view; firstly, she produces and exports considerable quantities of wine, and secondly her barley competes with, and exceeds slightly in price, South Australian barley. It is believed that the higher price of Chilean barley is due to the primitive method of threshing by means of trampling mules and then winnowing in the wind—the wheat-harvesting machinery used in Australia to harvest barley causing greater damage to the grain.

Vegetables, particularly beans, form the staple food of the populace in Chile, and comparatively little meat is eaten by some sections of the community. The wine, which is light and of high quality, is much in favour. The primitive cultural methods employed are well illustrated by wooden ploughs drawn by bullocks, and the use of sickles which are used almost exclusively for harvesting the cereal crops.

On the other side of the Andes, the Mediterranean type of climate no longer occurs over extended areas; instead there is practically an ideal distribution of rainfall over most of the Argentine, with 30 per cent. in each of three seasons and 10 per cent. in winter.

The Argentine is a country of vast but only partially exploited resources. To the west of the River Parana, navigable by ocean liners for over six hundred miles above Buenos Aires, lies a wonderful plain, the portion in Argentine being about 1200 miles in length and averaging about 400 miles wide, all receiving from 24 inches to 48 inches of average annual rainfall, almost perfectly flat, very fertile, with water obtainable at most points, between 5 and 20 feet from the surface. Nearly four million acres of low-rainfall country are irrigated.

More meat is exported from this country than from the rest of the world. The Argentine also leads all other countries in the export of maize and is the second biggest exporter of wheat. Wine production approaches 180 million gallons, compared with Chile 53 million in 1934, and Australia's greatest, 22 million. This country also produces half the world's linseed.

Lucerne is the principal crop grown. Fourteen million acres are under this crop and it is common to obtain seven or more cuts in a year. On the

other hand, livestock diseases, locusts and weeds are exceedingly prevalent and plants such as the common fat hen and couch grass grow to gigantic proportions. Much of the cropping is carried out for the express purpose of preparing the land for lucerne. Fertilisers are not applied except to orchards and market gardens. Bones, blood and slaughter-house fertiliser products in general are exported in large quantities to the United States.

The standard of the beef cattle is excellent. The Shorthorn is the outstanding breed, followed by the Hereford and the Aberdeen Angus. The high standard of stock management is attributable to British influence. Market gardening, which has tended to become controlled by Italians, is conducted in a competent manner, as are the vineyards and orchards also. The general standard of agricultural efficiency, at all events in connection with ordinary farm crops, in direct contrast to the above, however, is particularly poor. The high natural fertility, combined with a system of short-term share-farming agreements, has tended to inhibit the development of modern cultural methods, and yields consequently suffer.

Politically, the republic has been unsettled and has seen much bloodshed during the last fifty years. It is, however, a white man's country, and according to the present-day valuation of the London Stock Exchange, £500,000,000 of British capital is still invested there. The Argentine is Australia's greatest competitor at the moment and appears likely to develop into a still more serious competitor in the near future, and it seems evident that Empire preferences must continue to play an important part in the retention of our present markets. Australia by purchasing more British goods, and by so doing putting the balance of trade in Britain's favour, could expect preferences which are now largely given as a matter of grace.

South Africa is naturally a poor country, with soils of low fertility and only moderate rainfall conditions. One-third of the total area receives less than ten inches of average annual rainfall, and there is much stony land and desert, particularly on the western side. Fruit production is both prominent and efficient. Soft fruits are prepared, stored and marketed probably more efficiently than in any other country. In regard to livestock and cereal production, however, South Africa is not likely to compete seriously with Australia. This is also so in wool production, at all events while the embargo on the export of Australian Merinos remains in force, because the improvement of South African flocks has depended in the past on Australian Merino rams. Since the embargo has been placed on the export of Merino rams from Australia, some difficulty has been experienced in maintaining wool quality, and robustness and evenness of the animals.

The Improvement of Australian Wheat

MILESTONES IN ITS PROGRESS. PART II.

By H. Wenholz, B.Sc.Agr.

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OTHER WESTERN AUSTRALIAN WHEATS

In addition to Nabawa, other useful wheats were developed in Western Australia from the unfixed crossbred material taken from New South Wales by Mr. Sutton in 1911. One of these was the variety Geeralying, a Huguenot-Bunyip cross, which was fixed at the Narrogin School of Agriculture, Western Australia, and named in 1916. Geeralying also inherits the flag smut resistance of the Bunyip parent, and in addition a good measure of resistance to stem rust from the Huguenot (durum) parent. Its chief fault is that it tends to shed its grain easily. It is a very early maturing wheat which by 1934 had become the ninth leading variety in Western Australia, and it was also grown on 28,992 acres in 1934 in New South Wales.

Two other wheats derived from New South Wales material taken to Western Australia by Mr. Sutton in 1911, viz., Carrabin (Cedar x Florence) and S.H.J. (Florence x Jonathan), were fixed and distributed in 1917 and 1919, respectively. Neither of these wheats has yet made much progress, but they are now being given more attention because of their high strength or baking quality.

AN INDIAN WHEAT

About the year 1916, the introduction was made into New South Wales of Pusa 4, an Indian wheat of excellent baking quality. Although of such high quality, Pusa 4 cannot be regarded as a very productive wheat under Australian conditions. It is a very early maturing variety, and was the leading wheat in Queensland in 1929 and 1930, but receded to fifth position in 1934. In New South Wales, its culture has been extended somewhat in recent years, being cultivated on 42,393 acres in this State in 1934. It is of little significance in other States, being grown on only a few thousand acres in South Australia, and in Western Australia. With the preponderating weakness of Australian wheat, local millers and bakers have encouraged the cultivation of this variety for which a premium of 3d. or more per bushel is often paid, but Pusa 4 yields so relatively shyly in most districts that not even this premium may make its culture profitable.

MORE PYE WHEATS

It so happens that the next variety worthy of being recorded in Australian wheat history is also a wheat which was cultivated mostly on account of its good grain quality for which a premium was usually paid. This variety is Minister, which was produced by Mr. H. Pye at Dookie Agricultural College, Victoria, in 1917. In this wheat Pye made an attempt to combine the high quality of a Fife-Indian wheat with the high yielding capacity of Dart's Imperial, which was one of the most productive varieties of Purple Straw type ever grown in Australia. Although good, the quality of Minister is not equal to that of the Farrer Fife-Indian wheats Cedar, Comeback, etc., but Minister proved to be a little more productive than these wheats. In 1925, Minister attained to the position of the twelfth leading variety in Victoria, and the fourteenth most popular wheat in New South Wales, but it has since been regarded by farmers as insufficiently productive and has dropped to positions of insignificance in both States, where only a few thousand acres of the variety are now grown.

About the same time, Pye also introduced the variety Joffre, which was aptly named at the period because it contained wheat of French parentage (Red Bordeaux), the other parents being Fife and Indian wheats. By 1930, Joffre had become the ninth leading wheat in Victoria, but is now declining rapidly in popularity in that State. It is grown on a few thousand acres in South Australia, but its culture has not spread to other States.

MORE SOUTH AUSTRALIAN WHEATS

Following closely on the heels of Ford, two additional varieties of note, viz., Sultan and Felix, were evolved by South Australian breeders. In 1932 Sultan and Felix occupied tenth and eleventh positions respectively in point of acreage in South Australia, although both varieties now appear to be declining in area. Neither variety is cultivated to any extent in other States.

The advent of Federation in 1900, and its suitability to many conditions throughout the Commonwealth, naturally focussed attention on it largely to the exclusion of other good varieties, and one very good wheat which was thus overshadowed by Federation but which later forged its way to the front by reason of its superiority, was the variety Gluyas. This variety was a selection made as early as 1894 from a crop of Ward's Prolific by Mr. H. J. Gluyas, Telowie, South Australia. As previously indicated, Gluyas wheat is thus fundamentally of South African origin. As a late maturing selection was made from this variety by Mr. Spafford in South Australia in 1906, the original variety was named Gluyas Early.

Gluyas Early displaced Federation from the position of the leading variety in South Australia in 1924, and it maintained this position until 1930 when it was relegated to second place by Nabawa. It has now dropped to sixth place, being grown an 219,069 acres in South Australia in 1934. Gluyas Early also

occupies second position amongst varieties in Western Australia, being cultivated on 381,703 acres (13 per cent.) in that State in 1934. It is not so popular in New South Wales or Victoria, but there is no doubt about its inherent productiveness under dry conditions. This character has since been made use of considerably by Australian wheat breeders, the varieties Nabawa, Waratah, Gluclub, Aussie (Merredin), Clarendon, Noongar, Bencubbin and Sutton owing their productiveness under these conditions largely to the Gluyas parentage.

Late Gluyas also came to be an important variety in South Australia, where it was the fifth most popular wheat in 1932, being cultivated on 261,352 acres, having dropped, however, to 125,936 acres in 1934.

Another very useful contribution to the list of notable Australian wheats has been made by a South Australian farmer named Penny, who made a selection from a Purple Straw type of wheat and had the honour of having it named after himself. Purple Straw wheats have played a big part in Australian wheat culture, but their part is now best represented by their use as parents in breeding. Penny, however, is a typical club-headed Purple Straw, and it really represents practically the only typical Purple Straw wheat now cultivated to any extent in Australia. It is therefore a tribute to the excellence of the variety that it is the sole significant relic of the pure Purple Straw type. Strangely enough, Penny wheat is not now cultivated to any extent in South Australia, but in 1930 it reached the position of the fifth leading variety in Victoria with 184,490 acres, and the seventh leading wheat in N.S. Wales with 130,000 in 1932. Its high susceptibility to flag smut and its very weak flour strength are now rapidly bringing about its replacement in both States by better varieties from these standpoints.

Another selection by a South Australian farmer should also be recorded as being worth a place among notable Australian wheats, viz., Baroota Wonder. This wheat is a white-chaffed selection made by Mr. G. Crittenden, of Baroota, South Australia, from a crop of Ward's Prolific. It has already been noted that Gluyas Early is a selection from the same variety. Baroota Wonder, which is an excellent early hay wheat, also yields fairly well for grain under dry conditions, but it never assumed the importance in South Australia that it did in Western Australia where it became the sixth leading variety with 106,957 acres in 1926. In 1934, however, it had dropped to about one-third of this area. Baroota Wonder had a vogue to the extent of 12,916 acres in New South Wales in 1925, but it is now mostly grown for hay, for which it is unquestionably the best early variety almost throughout the State.

A RICH PERIOD IN NEW SOUTH WALES

It has been observed that a long period of dearth of new varieties took place in New South Wales immediately after Farrer's death in 1906 until the production of Canberra, Hard Federation and Clarendon in 1914-1916, and

there was again another empty period until 1921 when Pridham's work began to bear fruit. In this year Hurst, working at Wagga Experiment Farm under Pridham's direction, evolved the variety Waratah which was the result of crossing one of the Purple Straw types with Gluyas Early. Thus the value of this wheat as a parent in breeding is again indicated. Waratah made rapid headway in New South Wales. By 1925 it had become the sixth leading variety with 122,839 acres, and in 1929 it was the leading wheat with 817,138 acres (19 per cent. of the total wheat area). Although it has dropped to fourth position with 360,783 acres (8.8 per cent.), it can lay claim to being one of the most important varieties bred in this State. It rose to the fifth position with 241,559 acres in South Australia in 1934, and to the seventh position with 121,103 acres in Western Australia in the same year.

As if to make up for the long period of scarcity of improved varieties of wheat in New South Wales, the period 1921 to 1925 was rich in the production of new wheats which were the outcome of the thought and devotion which Mr. Pridham had been giving to the task since 1911. Aussie, Riverina, Wandilla, Union, Bena, Duri and Bobin, all of which made some mark on the history of New South Wales wheat, were produced during this period.

On its breeding, viz., Federation x Gluyas Early, Aussie might be expected to be a productive wheat. It is earlier than either parent and has just the moderate resistance to stem rust of its Gluyas parent. It therefore became popular for late sowing on the north-western Slopes of New South Wales, and by 1934 it had increased in area to 31,317 acres, chiefly taking the place of Canberra in this district. Unfortunately, it is highly susceptible to flag smut and has somewhat weak straw, so that its culture is even now declining in favour of better wheats. The variety Merriden, of the same breeding, is practically identical with Aussie, and is the fifth leading wheat in Western Australia, where it was grown on 311,767 acres in 1934.

Riverina is a sister wheat to Canberra, being similar to it in many respects, viz., yield, early maturity, but differing from it in being highly resistant to flag smut. It has therefore taken the place of Canberra to a large extent, being cultivated on 30,028 acres in New South Wales in 1934.

Of all the wheats produced about this time by Pridham, Bena was one of the best. This variety is considered by Pridham to be the result of a natural cross between Hard Federation and Marshall's No. 3. It is from the latter parent that it derives its productiveness, but its inherent grain quality is somewhat below that of Hard Federation. Although practically unknown in 1925, Bena became the seventh variety in order of popularity in New South Wales by 1929, when it was grown on 195,126 acres. In 1934 it was still cultivated on 71,659 acres in this State, and on 97,651 acres in Western Australia, where it occupied eighth position among varieties in that year. It is a

very productive wheat under good conditions, but its susceptibility to stem rust and to flag smut will preclude its extension in area much further.

THE VALUE OF STEINWEDEL

In 1900, before Federation came on the scene, the old variety Steinwedel, considered to be of African origin, was the most popular variety in Australia for growing under dry conditions. It undoubtedly had productiveness under these conditions, but had the defect of shedding its grain badly when ripe. Despite this fault, farmers in dry districts at the close of last century found that even when they lost a bag or two to the acre from shattering, it was still more productive than most other varieties at that time. Farrer used it as a parent in some of his crosses, but never evolved any useful variety therefrom. It remained for Pye of Victoria to produce the first wheat of value from a Steinwedel cross. This variety was Improved Steinwedel, which was the result of crossing Steinwedel with Purple Straw. The bad shelling habit of Steinwedel was corrected to a large extent in this cross, from which Pye also made an awnless selection which was called Bald Early. In 1925, Bald Early was the sixth leading wheat in Victoria, and was still in eighth position with 99,889 acres in 1928. But it has since declined, being grown on 11,918 acres only in that State in 1934. It has never made much headway in New South Wales, despite a good resistance to dry conditions.

Pridham had, however, noted the drought resistant qualities of Steinwedel and used it in crossing with Thew to produce the variety Bobin in 1925. By 1934, Bobin had become the third leading wheat in New South Wales, with 449,313 acres (10.9 per cent.) under cultivation, chiefly in the western and southern districts. Although very productive under dry conditions, the tendency of Bobin to produce pinched grain is so accentuated under some conditions, and was particularly so during the rust season of 1934, that the variety is already beginning to suffer a setback. There is no doubt, however, that the old variety Steinwedel or some of its derivatives will one day figure in a useful wheat for dry conditions. Steinwedel or Improved Steinwedel has the additional virtue of being resistant to flag smut.

ANOTHER PYE WHEAT

Club wheat enters into the parentage of still another variety, viz., Gluclub, which has made some headway in Western Australia. This wheat was produced by Pye in Victoria as the result of crossing Gluyas with a Club wheat. The parent Gluyas may largely explain its ability to yield, especially under dry conditions, for this character was responsible for it becoming the fourth leading wheat with 316,830 acres in Western Australia in 1934. Club wheats are grown largely in the Pacific Coast States of U.S.A. and are largely responsible for the marketing of such wheat in a separate commercial sub-class, which is of such low gluten quality that it is specially desired for biscuit manufacture

and for a section of the Eastern trade. Gluclub apparently has the gluten qualities of the Club parent, for its extended culture in Western Australia and its mixture with commercial f.a.q. wheat have been the cause of much annoyance to, and discrimination against it by millers and bakers in the western State.

MR. G. S. GORDON'S VICTORIAN WHEATS

Since the early days of Mr. H. Pye in Victoria, little progress in wheat breeding was made in that State until the programme of wheat breeding initiated by the Victorian Department of Agriculture at its Experiment Farms Longerenong and Werribee began to bear fruit, firstly with the production of Gallipoli in 1917 and then of Nizam, Ranee, Rajah, Sepoy and Ghurka in 1924, and of improved strains of some of these varieties in later years.

Mr. A. E. V. Richardson (now Professor, of the Waite Research Institute, South Australia) was responsible for the cross which produced Gallipoli, the parents of which were a Club wheat and Yandilla King. The original variety which was distributed in 1917 proved very tough and unsatisfactory to harvest, and as it was not quite fixed in this character, further selections were made from it at Werribee by Mr. G. S. Gordon who obtained a fixed type which "stripped" readily and which was named Free Gallipoli and distributed in 1926.

In 1934, Free Gallipoli was the leading wheat in Victoria with 1,059,281 acres (41.1 per cent.). In South Australia, it was the third most popular variety in 1934 with 295,503 acres (8½ per cent.), and the fifth most important variety with an area of 202,640 acres (4.9 per cent.) in New South Wales in 1934. It was also grown on 53,133 acres in Western Australia during 1934. The chief merit of Free Gallipoli is its productiveness under the comparatively cool, slow ripening conditions which obtain in the southern States and in the southern border districts of New South Wales. Its culture cannot extend to the more northern Slopes and Tablelands in New South Wales because of its high susceptibility to stem rust. Its high susceptibility to flag smut also imposes limitations on the variety, and its poor baking quality will now also undoubtedly help in causing it to be largely superseded in the near future in all States.

Ranee is the result of a cross which was made between an Indian wheat and Federation by Mr. I. Tulloh at Longerenong College, but which was developed and selected under the supervision of Mr. Richardson at Werribee Research Farm. It was named and distributed in 1924. By 1934 it had become the second leading wheat in Victoria with 557,430 acres (21.6 per cent.), the second leading variety in South Australia with 495,175 acres (14.3 per cent.), and the seventh in New South Wales with 165,647 acres (4 per cent.). It is thus an important contribution to the list of Australian varieties of wheat. Although productive, it is unfortunately susceptible to flag smut, and not of good baking quality, and it will eventually be superseded by better varieties in

these respects. An improved yielding strain of the variety, known as Ranee 4H, was developed by Gordon at Werribee and distributed to growers in 1930.

Rajah, an Indian-Purple Straw cross, has a history similar to that of Ranee, being first distributed in 1924. It became fairly popular in Victoria on account of its suitability to dry conditions. In 1928, Rajah was the seventh leading variety, occupying 110,054 acres (3½ per cent.), but it has since been superseded largely by Ranee and Ghurka in that State. In New South Wales, 21,705 acres of Rajah were grown in 1934, chiefly in the southern border districts. As would be expected from its breeding, it is of rather poor baking quality. An improved strain of Rajah, from the standpoint of yield and strength of straw, was developed by Gordon and distributed in 1928.

Nizam is another Indian-Federation cross which was developed at Longerenong College, and which was named and distributed in 1924. By 1929 it had become the seventh leading wheat in Victoria with 133,155 acres, but it declined in 1934 to 35,401 acres and it has not extended appreciably to other States.

In 1915, a particularly attractive plant in an unfixed progeny of an Indian-Federation cross was crossed with Currawa by Gordon at the State Research Farm, Werribee, to produce the variety Sepoy in 1924. By 1934, Sepoy had become the fourth leading wheat in Victoria, being grown on 114,791 acres in that year. It has not spread very much into other States, and its susceptibility to flag smut may prevent it making much headway.

Ghurka, which contains Indian. 4, Federation, Currawa and Gallipoli in its parentage, was evolved also by Gordon in 1925. Ghurka thus has, like Currawa, both club wheat and durum wheat included in its ancestry, and it has similarly a good resistance to dry conditions; by 1934 it had become the third leading wheat in Victoria with 398,008 acres (15.5 per cent.). As would be expected from its breeding, Ghurka is low in inherent baking quality.

In the improved strains of Free Gallipoli, Ranee 4H, and in Sepoy and Ghurka, Gordon has made a very real contribution to the list of important wheats in Victoria, as these varieties together occupied 82.7 per cent. of the total area under wheat in that State in 1934.

RECENT WESTERN AUSTRALIAN WHEATS

Since Gluyas Early was so productive and had been so successful as a parent in Western Australian wheats, it was natural that this variety should have been used for crossing with a very early ripening wheat in order to supply the need in the early districts of Western Australia for a productive, quick maturing variety. The cross with Sunset was made at Chapman Experiment Farm in 1917, and developed by the late Mr. E. J. Limbourn at the Merredin Experiment Farm. The variety was named Noongar and was distributed in 1926. In 1934, Noongar was the sixth leading wheat in Western Australia,

being grown on 166,652 acres. It is thus an important and valuable contribution to Western Australian wheats, but its cultivation has not so far extended to other States.

A more recent variety, Bencubbin, which is of the breeding Gluyas Early by Nabawa, was evolved by Limbourn at the Merredin Experiment Farm in 1929. It is very similar to Nabawa, and like it, highly resistant to flag smut and very productive. It has had a phenomenal rise in popularity in Western Australia where it has displaced Nabawa to occupy first position with 649,014 acres (.23 per cent.) in 1934. Like its parents, it is not of inherently good baking quality.

Totadgin, another recent variety of the same breeding as Bencubbin, developed by Limbourn, is also resistant to flag smut and is stated by Sutton to have been selected with the object of replacing Gluyas Early in districts where flag smut renders that and other early maturing varieties, such as Merredin, undesirable. Totadgin was grown on 41,912 acres in Western Australia in 1934.

Australian wheat growers owe the late Mr. E. J. Limbourn a debt of gratitude for these three varieties, which together occupied about 30 per cent. of the wheat area in the western State in 1934 and of which Bencubbin and Totadgin are likely to attain some popularity also in other States.

QUEENSLAND WHEATS

Florence has been the leading variety of wheat in Queensland for many years, but whereas it occupied 50 per cent. of the area in 1924, this proportion has dropped to 16 per cent. in 1934. Pusa 4 and Clarendon have also been very popular wheats in Queensland for some time, but the efforts of Mr. R. E. Soutter, working under great disabilities in breeding wheat at a State farm outside the main wheat belt, are being slowly but surely rewarded. His three best varieties, viz., Three Seas (CCC), Flora and Cedric, evolved respectively in 1920, 1923 and 1925, occupied between them in 1934 about one-third of the wheat area in Queensland, and nearly another 10 per cent. is occupied by other wheats of his breeding such as Novo, Amby, Warchief, Duke of York, Watchman, etc. Soutter's chief objectives in breeding wheats for the Queensland climate are early maturity, high grain quality and resistance to stem rust combined with productiveness, and it is a tribute to his capabilites that he has evolved three varieties which have these characters and which have so largely taken the place of Florence, for this variety is itself so good in all the characters mentioned.

A RECENT SOUTH AUSTRALIAN WHEAT

Ford and Sultan have been such good wheats in South Australia that it is not surprising that a good variety, viz., Sword, has been derived from their mating. Mr. R. C. Scott named the variety Sword for distribution in 1925,

from the cross made in 1920. Resistance to stem rust was one of the objectives aimed at, and in this respect Sword is about equally as resistant as Ford. It is, however, not equal to Ford in grain quality or in resistance to flag smut, but probably on account of its greater earliness it is more popular than Ford in South Australia, being the fourth leading wheat with 277,715 acres (8 per cent.) in 1934. It seems likely also to make some headway in New South Wales.

BARINGA AND DUNDEE FROM NEW SOUTH WALES

Probably one of the best wheats produced in New South Wales since Waratah is the variety Baringa, which was evolved at Wagga Experiment Farm under Pridham's guidance in 1925. The design in breeding this variety was to replace the red-grained variety Bomen by a similar white-grained wheat. Bomen, which was from a Fife-Indian cross, had attained a considerable popularity in many parts of New South Wales, by reason of its productiveness and disease resistance, but it had to be given up because red-grained wheats were not acceptable for export from Australia. Bomen was therefore crossed with Gullen which was of Yandilla King and Zaff (Indian) parentage, and there is no doubt that the productiveness of Bomen was still further increased by this crossing. It will thus be seen that Baringa is still another example of the high yielding capacity which has come from combining the Fife-Indian wheats with the old Purple Straw. Baringa was only recently distributed to farmers in New South Wales, and in 1934 was cultivated on 38,400 acres. There is little doubt that its high productiveness combined with a good resistance to flag smut and other good field characters will ensure its rapid extension in area in this State in the next few years.

Although Baringa contains Fife parentage, it has not inherited much, if any, of the flour qualities of a Fife wheat. It has rather the flour qualities of the Indian parent, good dough stability and high water absorption, but not very good elasticity or extensibility. In all these respects, however, it is superior to Yandilla King, Federation, Free Gallipoli, Nabawa and Bobin, all of which it is expected to replace to some extent in cultivation in New South Wales, so that the general baking quality will thereby be improved on this account.

The latest production by Pridham, viz., Dundee, is the most promising variety which has appeared in New South Wales for very many years. Evolved in 1927, it has risen very quickly to become the eighth leading wheat in 1934 in this State with 111,679 acres (2.7 per cent.). So far it has given best results on the south western Slopes, where it has exceeded Federation in yield in some districts by as much as 7 or 8 bushels per acre. It is moderately resistant to flag smut, but its chief meritorious features are productiveness combined with relatively short, strong straw and good grain holding capacity. It is, moreover,

of moderately good inherent baking quality, this character being derived from two of its parents, Hard Federation and Sands. The other parent, Cleveland, apparently provides the yielding qualities, as is indicated from several other Cleveland crosses which are quite promising in New South Wales. Dundee is susceptible to stem rust and will not be as good as Ford in districts liable to this disease, but it is expected to take the place largely in New South Wales of Free Gallipoli, Federation, Bena, Union and Hard Federation at least—which between them are grown on about 10 per cent. of the area under wheat at present—and also to some extent even of Nabawa and Waratah which are of nearly similar maturity. This will undoubtedly mean a very great improvement in the baking quality of New South Wales wheat in the near future.

It is considered that Pridham's contribution to the honour roll of wheat varieties in Australia in the variety Dundee will be entitled to a place not far behind that of Farrer's Federation and Western Australia's Nabawa, the two varieties which at present deserve first and second place respectively in Australian wheat history.

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The Nomenclature of Soils

by

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The proper nomenclature of natural objects may be regarded as a prerequisite and essential part of any system of classification. It is only when an object has been named, and that name has received universal sanction that the discussion of its place in the system of nature becomes free from ambiguities and possible misunderstandings. It would be difficult to conceive of botanical or zoological science without such a system of universal nomenclature which would imply at least by published description if not in the name itself the relation of a given species to the rest of the biological world.

The achievement of Linné in this field of biology was no less marked in the third great kingdom of Nature and it is rarely realised to-day how completely logical was the Linnean system in including not only animals and plants but minerals as well. The origins of soil nomenclature and classification will be found in this system. About the time of Linné many attempts were being made to seek some order in the mineral kingdom, attempts which were eventually solved independently of the Linnéan system through the development of chemistry and crystallography. Bromel (1730) of Stockholm is quoted as having classified minerals into: earths, salts, sulphurs, stones, calculi, semimetals and metals, some of which classification still survives in pharmaceutical nomenclature.

The earliest classifications of Linné (Leyden 1736, 1748) divided the mineral kingdom into stones, minerals and fossils, the latter including earths which were further subdivided into marl, ochre, chalk, clay, sand and soil.

In the *Systema Naturae* of 1770, the perfection of a complete system of soil nomenclature and classification is more evident. The Mineral Kingdom, *Regnum Lapideum*, included under the heading *Terrae* or earths the following genera:

Ochra: ochre or metallic earth.
Arena: sand or rough earth.
Argilla: clay or plastic earth.
Calx: effervescent earth.
Humus: vegetable earth.

As examples under the genus Arena Linné gives *Arena mobilis, A. ferrea, A. silicea, A. rustica* amongst others, while Argilla and Humus respectively include species such as *A. communis, A. nilotica* (habitat in Aegypti agris), *A. porcellana, H. ruralis* (habitat ubique), and *H. turfa.*

This binary system of nomenclature is of course identical with that developed for the animal and vegetable kingdoms. His definitions of clay and sand are also worth quoting:

Argilla: Terra maris sedimenti viscidi; particulae amorphae impalpabilis, mollis, tenacis, lubricae. Humido emollienda, unctuosa, plastica, igne induranda.

Arena: Terra aquae, particulae distinctae, granulatae, siccae, durae, scabrae; humido non penetrandae conglutinandae (acido non dissolubilis).

A glance through the text books of agricultural chemistry through the following century reveals how closely the Linnean system was followed and—as was then frequently the case—copied from author to author, the names however, being given to the soil constituents rather than to the soils themselves. Thus Schubler (1838) classifies soils according to their relative proportions of Clay, Sand, Lime and Humus—four out of the five classes of Linné. Schloesing (1883) repeats the list: "on distingue quatre sortes d'éléments dans les sols; le sable, l'argile, le calcaire, et la matierè organique." By taking into account the relative proportions of these constituents Schubler was able to introduce new soil classes such as calcareous sand and argillaceous sand. The term loam was reserved for mixtures of humus and the mineral constituents—thus sandy loam was a mixture of peat and sand. Quite early in the century, Davy in his Elements of Agricultural Chemistry based on lectures given between 1802 and 1812 gave the first quantitative expression to the subject and suggested that a soil should not be described as a sandy soil unless it contained at least seven-eighths of sand, and the term "clayey soil" only applied to such as contained more than one-sixth of impalpable earthy matter. Loams would contain one-third impalpable earthy matter and effervesce with acids, while peats should contain at least half of vegetable matter.

The soil classes developed in this way included sands, sandy loams, loamy sands, marls, calcareous soils, clays and clay loams. Various attempts were made to add precision to the quantitative aspects of these class definitions but no definition could be really satisfactory until precise methods of mechanical analysis were developed in more recent years.

With the beginnings of soil surveys in the United States in 1899, these original genera of Linné were replaced by soil classes which became rapidly more numerous with the increase of field experience in the soil surveys, while the developments in colloid science enabled accurate definitions in respect of particle size to be attempted, leading to the final establishment of specifications for the terms "clay," "silt," "fine sand," "coarse sand," and "gravels."

In one respect, however, the United States survey went back to the Linnean system in the matter of a binary system of nomenclature. Following geological practice, however, the specific name was replaced by a geographical *series* name.

Such geographical names are of course quite common in the Linnean system, probably more so to-day than in Linné's time and there is no essential difference between the *Argilla nilotica* of Linné and the *Nile clay* of the American system as first established.

Independently of this development, however, an entirely new system of soil nomenclature and soil classification was being developed by the soil workers in the geological institute of the Russian Academy of Sciences. In 1883, Dokuchaev published his famous account of the black soils of the Russian steppes, soils which had always attracted the notice of geographers; this soil was described under the name of *Chernozem,* or "black earth," meaning more literally "the black land" and the importance of soil morphology in the field, particularly in a vertical direction, was emphasised. To this soil type were added in turn the *Podsol,* from a Russian peasant word meaning *ashy* soil, and the Brown earth of Ramann. The Russian workers have in recent years attempted to standardise nomenclature along these lines and have developed the terms "Burozem" for brown earth, "Serozem" for grey earth, and "Krasnozem" for red earth. In a somewhat similar way Wolfanger (*"The Major Soil Divisions of the United States,"* 1930) in the United States has rationalised and anglicised the system by the use of the terms: "blackerths," "chestnuterths," "brownerths," "grey-brownerths," "red-and-yellowerths," and "prairyerths."

The use of a colour nomenclature is the most characteristic feature of the new system, while a further characteristic is that many such names have significance to the practical farmer and in popular usage generally. Unlike the Linnean system based on the hand specimen, however, the new system is based on field characteristics with respect to texture, structure and colour to the whole depth of soil development, and for each soil name a definite sequence of horizons in a soil profile is indicated. Certain difficulties are evident, however—

there are two groups of brown soils, one a leached group, weakly podsolised, characteristic of the deciduous forest zone, and the second an arid group more characteristic of the semi-desert steppe. Other names have also been adopted from popular nomenclature in other countries such as the Renzina from Poland and the Regur from India. Extensive soil groups like those of the moister prairies in North America do not quite fit into the Russian system while the present writer has introduced the name "mallee soil" for an extensive group of Australian soils—using the word in its geographical sense as in Victoria, rather than in its ecological sense. Even in this case, however, much less confusion is likely to be caused in international and interstate literature if a description such as "grey-brown earths weakly solonized" were to be substituted for the term "mallee."

The relationship of the two systems of nomenclature has become clearer with experience in soil surveys. By 1909, Whitney[1] had already recognised the morphology of the entire soil profile to be the only possible criterion for soil classification. The soil type became the unit, with its binary name no longer representing genus and species but with order inverted, series and class—the series name implying by published description the sequence and characteristics of the soil horizons, and the class name the texture of the surface horizon familiar to the cultivator. Such types are found to fall naturally into groups of related soils which have been called *families* in the United States, *suites* in Wales, and in a somewhat different sense, *Catenas* and *fascs* in East Africa[2].

Each type, however, is a recognisable member of one of the great soil groups developed from the Russian system, and there is reason to believe that the two systems of nomenclature with their common basis of classification will take their place side by side, the binary system for the naming of individual soil types and some development of the Russian system for great soil groups of the world.

(1) Whitney, Milton. "Soils of the United States." U.S.D.A. Bureau of Soils, Bulletin No. 55, p. 22. 1909.

(2) See Milne, G. — Proc. 2nd Conf. East African Agric. and Soil Chemists, p. 48. 1935.

TECHNICAL NOTES

THE EFFECT OF ENVIRONMENT ON THE PRODUCTION OF PRIMARY LESIONS BY PLANT VIRUSES.

Advances in our knowledge of the nature and properties of plant viruses depend upon the accuracy of methods used to estimate the concentration of active virus units in a given suspension. So far no method has been devised which will give a measure of the actual number of such units, but Holmes' primary lesion method has made it possible to compare a series of suspensions amongst each other especially when used with improvements introduced by Samuel and others. The basis of these comparisons is the dilution curve obtained by plotting the number of lesions produced by inocula of known *relative* virus concentrations against the dilution or relative concentration. Most of the work on dilution curves has been carried out with ordinary tobacco mosaic virus and some difference of opinion exists between the workers concerned as to the nature of the curves obtained and the reason for certain differences. Many of these differences may be due to differences in technique and in the nature of the suspension medium, lack of control of pH value and electrolyte content of inocula and the like, but one important factor seems to have been overlooked, namely the host or test plant.

In many respects the primary lesion method of estimating relative virus concentrations may be compared with the plate method in common use for estimating relative concentrations of bacterial suspensions. In the former case, however, we have to deal with what amounts to a living culture medium which is continually changing even after inoculation. We are dealing, in fact, with a virus-plant inter-relationship which we may expect to be affected by external conditions and further to differ from virus to virus, and from one species or variety of test plant to another according to the mechanism of the interaction between virus and plant. The variation in the number of lesions produced on plants inoculated with the same suspension at the same time in the same way is usually attributed to differences in the number of possible or potential points of entry. Although this may be of some importance, especially in setting a limit to the number of lesions a leaf is capable of producing, a more probable explanation is that the observed variability is due to differences in the interaction between plant and virus, i.e., the effect is an internal one of a bio-chemical nature. It is essential to be able to distinguish between these effects before the results of lesion counts can be properly interpreted and before valid conclusions can be drawn concerning the degree of dispersion or aggregation of virus particles.

A study is therefore being made on the effect of varying conditions of temperature, light, etc., on the rate of development and total number of primary

lesions produced. So far the work has been confined to the viruses of tomato spotted wilt (T.S.W.) and ordinary tobacco mosaic, and in the main to primary lesions of these viruses on *Nicotiana tabacum* and *N. glutinosa.*

If a batch of tobacco plants is inoculated with one and the same T.S.W. inoculum and then one half of the batch is transferred to the glass-house while the other is kept in the laboratory for two or three days before transfer, a marked difference is found in the number of lesions produced on the two batches. Plants kept in the laboratory for some days after inoculation develop about twice as many lesions as those transferred to the glass-house immediately after inoculation. Progressive counts of the lesions developing under glass-house conditions show that lesion development is inhibited by bright sunlight and experiments carried out in cabinets under controlled lighting and temperature confirm this inhibiting effect of light. Just how far this action of light is connected with a recent discovery by the author of a fluorescent substance immediately surrounding the lesions and with other bio-chemical factors is at present under investigation.

In the case of primary lesions of ordinary tobacco mosaic on *N. glutinosa,* more lesions develop under glass-house conditions than under laboratory conditions. Experiments in which light and temperature were controlled have shown that, provided the light available is sufficient for normal growth this difference is an effect of temperature. In one experiment, thirty-two four-leaved plants were inoculated at the same time with the same inocula.* One batch of sixteen plants was placed in a constant temperature cabinet maintained at 20°C. and the other batch in an adjacent cabinet maintained at 15°C. In both cases lighting conditions were comparable (artificial lighting—Ca 800 foot candles—continuous). The total number of lesions developed at 20°C. was 2,932 whereas 2,253 developed at 15°C., a difference which is highly significant.

For ordinary tobacco mosaic the dilution curve may be divided into three sections: (1) a flat portion at high concentrations where a large change in relative concentration is accompanied by only a small change in the number of lesions, (2) a straight line portion where a change in relative concentration is accompanied by an equivalent change in the number of resultant lesions, and (3) a section at high dilutions where the fall in the number of lesions is again proportionately smaller than the change in relative concentration. The shape of the curve is the same whether purified or unpurified virus suspensions are used but the physiological age of the test plants and the conditions under which the lesions develop appear to have an effect on the range over which the straight line relationship holds.

* The inocula were prepared from a sample of virus purified by precipitating it from clarified plant juice at the iso-electric point of the virus or associated protein (pH 3.4 + .2).

In the case of the virus of tomato spotted wilt, the dilution curve may also be divided into three sections. The first two are similar to those for mosaic, but the third section at high dilutions where the number of lesions per leaf is small has a slope greater than 1, i.e., the fall in the number of lesions is proportionately greater than the change in relative concentration of infective juice. The slope of this third section, however, depends upon conditions prevailing during the time the lesions are developing and may be reversed. It depends also on the time elapsing between the first appearance of the lesions and the time of counting. Although possible differences in the degree of aggregation of virus particles must be taken into account in finding an explanation for these phenomena, it is first necessary in view of the above results to examine the effect of reactions taking place in the leaf which lead to the final necrosis.

The idea that a minimum or critical infective unit (possibly amounting to some millions of virus particles) is necessary for the production of a single visible necrotic lesion, and the variability of this minimum unit with environmental conditions and also from leaf to leaf and from part to part of the same leaf, is being developed. The tendency of primary lesions to form in greatest number near the lateral veins points to the critical infective unit being smaller in the neighbourhood of the vascular system.

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SOILS AND MANGANESE DEFICIENCY.

That manganese is essential to the life of all the higher plants is now a well established fact. Manganese deficiency disease of cereals has been observed on various Australian soils, and its effect ranges from a slight reduction in yield to a complete failure of the grain crop. Oats, barley and wheat—in that order—are the crops most liable to suffer from deficiency, while many important pasture plants such as subterranean clover, rye grass, paspalum, and others, make healthy growth on soils on which oats may fail completely.

All these "deficient" Australian soils either have naturally, or have been brought by liming to, a pH value above 6.7, except a sample from Western Australia (1), which has a pH of 6.4, a remarkably low figure for a deficient soil. The total amount of manganese extracted from the soil by strong acids has little relation to the occurrence of deficiency symptoms, and the author has suggested (2) in explanation of the facts so far obtained, that manganese exists in the soil in the following forms (excluding unweathered minerals);

A. Bivalent manganous ion, present in the soil solution in equilibrium with exchangeable manganese.

B. Reactive manganic oxide, sometimes written MnO_2 but probably rather Mn_2O_3.
C. Slightly reactive Mn_2O_3.
D. Inert Mn_2O_3.

The bivalent manganous ion (A) is soluble, and plants use it freely, while the reactive manganic oxide (Mn_2O_3) (B), is not so easily available. Although the latter is quite insoluble in water at pH 7, it may be used directly by plants and can be a sufficient source of the element. The quantity of B present in a sample is estimated by its power of reacting with hydroquinone at pH 7. The forms C and D are less easily dissolved, and have a low availability.

In an acid soil such as a podzol, there is a steady liberation of the form A from the form B; this is due to the organic matter, which can reduce manganic compounds much more readily at low than at high pH levels. This ensures the supply of manganese so long as a soil remains acid. (In fact, soluble manganese salts may easily be toxic on acid soils.) But, if the acid soil is now limed and kept well aerated, the bivalent manganous ion (A) will be changed progressively into the reactive manganic oxide (B), according to the reaction:— $4\ MnSO_4 + 4\ Ca(OH)_2 + O_2 \equiv 2\ Mn_2O_3 + 4\ CaSO_4 + 4\ H_2O$. This oxidation of manganous compounds by air in an alkaline environment is a familiar reaction in analytical chemistry.

If the reserve of the forms A and B, before liming, did not exceed about 25 parts per million of soil (possibly this figure should be increased to 50 for safety), plants on the now alkaline soil may in time suffer from manganese deficiency, since a given amount of the element is much less available as B than as A. This last statement—that A is a much better source than B—has been put forward by many authors; for instance, it is known that a wet season, which means reduced aeration and therefore more A and less B at equilibrium, also reduces the severity of deficiency disease. But it seems essential to expand the former theory by including B as a useful form when present in large amount—for example, the Wimmera "black soil" tested contains only traces of A, but 137 parts per million of B; these black soils are never deficient. (It is interesting to note that the amount of manganese removed by a healthy crop is of the order of two ounces per acre, while the above figure for the B form of manganese in Wimmera soil is of the order of a quarter of a ton per acre in the surface soil.)

The chemical test of extracting the soil with hydroquinone at pH 7 has been found to separate deficient from healthy soils; and using this test the writer explained the bad effect of over-liming at Bellarine Peninsula (Victoria) and predicted that a podzol from Timboon (near Peterborough, Vic.) and another from Coleraine (Vic.), would be adversely affected by excessive liming. This has since been proved by pot tests with Algerian oats, which showed

symptoms of deficiency with each soil after heavy liming. The analytical values for the forms A and B before liming were 1 and 17 parts per million respectively. It is not yet possible to say how serious the effect will be in these cases, but it is clearly important to avoid over liming on such soils, since the apparently simple plan of applying manganese compounds to deficient alkaline soils is often disappointing besides being expensive.

While the above test distinguishes permanently healthy soils from those liable to deficiency, further work is undoubtedly needed to account for some of the differences in the seriousness of deficiency among the latter group.

University of Melbourne, Vic. G. W. Leeper.

(1) A. S. Wild, J.Dep.Ag.W.Aust. 11: 223, 1934.
(2) G. W. Leeper, Proc. Roy.Soc. Vic 47: 225, 1935.

BACK-CROSSING AND ITS USE IN PLANT BREEDING.

The back-cross has long been used in genetics as a valuable means of determining genotypes, and as the most accurate method of detecting linkages. Its use in the applied science of plant breeding has not always been fully recognised. It is true that the back-cross has been used with success in cases of inter-specific and inter-generic crosses involving self-sterility of the hybrids, but it has found little place in the realm of ordinary inter-varietal hybridisation.

Numerous cases arise in which a variety may be well adapted to a district and of excellent type, except that it lacks one important character which can be contributed by another variety of otherwise poorer type. Harlan and Pope (2) have pointed out that, postulating twenty or more desirable characters in parent X which are absent in Y, and the one in Y which is absent in X, chances of finding the desired re-combination in F_2 would be but one in some millions. The general result of the orthodox method of breeding in such a case would be to develop types possessing the desired character from Y, but lacking some of the favourable characters from X. Some such types may prove more valuable than X, but at best they represent a compromise.

Let us now examine the factorial results of repeated back-crossing of the F_1 and succeeding back-cross generations to one parent. If a plant of constitution Aa is back-crossed to AA, the progeny will be 50% AA and 50% Aa. If this progeny is again back-crossed to AA without selection, the next generation will yield 75% AA and 25% Aa. The expression for the proportion of plants homozygous for one factor pair possessed by the recurrent parent is $\frac{2^r-1}{2^r}$, where r is the number of successive generations of back-crossing.

Take now a case where two factor pairs are heterozygous in the hybrid and homozygous dominant in the recurrent parent (the double recessive would of course serve just as well).

B.C. Gen.	Backcross	Progeny AaBb	AaBB	AABb	AABB	Tot.	%AABB
1	AaBb × AABB	1	1	1	1	4	25.0
2	AaBb × AABB	1	1	1	1		
	AaBB „ „		2		2		
	AABb „ „			2	2		
	AABB „ „				4		
		1	3	3	9	16	56.2
3	1 AaBb × AABB	1	1	1	1		
	3 AaBB „ „		6		6		
	3 AABb „ „			6	6		
	9 AABB „ „				36		
		1	7	7	49	64	76.6
4	similarly	1	15	15	225	256	87.9
r	similarly	1	2^r-1	2^r-1	$(2^r-1)^2$	2^{2r}	$\frac{100\ (2^r-1)^2}{2^{2r}}$

The proportion of plants homozygous for both factor pairs after r generations of back-crossing is shown to be $\frac{(2^r-1)^2}{2^{2r}}$. Where the number of factor differences involved is n, this expression becomes $\frac{(2^r-1)^n}{2^{nr}}$.

From the above table (with $n=2$), the proportion of total factors homozygous after r generations of back-crossing $=$

$$\frac{(2^r-1)+(2^r-1)+2\,(2^r-1)^2}{2\,(2^{2r})} = \frac{2^r-1+(2^r-1)^2}{2^{2r}} = \frac{(2^r-1)(1+2^r-1)}{2^{2r}} =$$

$$\frac{2^r\,(2^r-1)}{2^{2r}} = \frac{2^r-1}{2^r}$$; this expression will be obtained regardless of the value of n.

Suppose now that two parents differing in 50 factor pairs were crossed, and the F_1 and succeeding progenies back-crossed to one parent without selection for six generations. The proportion of plants homozygous for all 50 factor pairs

will be $\left(\frac{63}{64}\right)^{50}$, or 45.50%, and these will be identical with the recurrent parent. The percentage homozygosity of all factors will, however, be $\frac{100 \times 63}{64} = 98.44\%$.

Of this total of 98.44% homozygous factors, the 45.50% of homozygous plants account for 45.50%, i.e., the 54.50% of heterozygous plants must account for (98.44 – 45.50)% or 52.94%. Thus the percentage of homozygous factors in these heterozygous individuals is $\frac{5294}{54.5}$ or 97.13%. This fact is of great importance, since although only about half of the plants are homozygous for all 50 factor pairs, the remainder must be homozygous for all except approximately one factor pair. It is very questionable whether one would wish to go further than this in actual practice.

Supposing that immunity to certain forms of black stem rust in wheat is a dominant character (as has been reported for variety Hope), and we wish to incorporate this immunity in a susceptible variety *X*, which is otherwise an ideal type for our locality. The procedure would be to cross *X* with Hope (or similar immune type), and back-cross a few F_1 plants to *X*. Immune plants are selected from the first back-cross generation and again back-crossed to *X*. This procedure is continued for five or six generations, or until a type heterozygous for immunity but otherwise identical with *X* is obtained. Such plants are then selfed, and the homozygous immune segregates extracted. A very attractive feature of the method is that exceedingly small populations are required each season to enable one to select immune parents for further crossing.

Where the desired character from the non-recurrent parent behaves as a recessive, the programme is lengthened by periodic selfings to bring to light again this recessive. Thus, after three generations of back-crossing with no scope for selection, one-eighth of the progeny should be heterozygous for the character sought, and seven-eighths homozygous for the undesired dominant. Selfing at this stage therefore allows an excellent chance of recovery of recessive individuals, which can be used to continue the back-cross programme.

Such methods have actually been put into practice by Harlan and Pope (2), in developing smooth-awned barleys, and by Briggs (1) in introducing bunt resistance into Baart wheat; a similar procedure has been adopted by Richey (3) in his plan for convergent improvement of maize.

L. G. Miles.

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Brisbane, Q.

(1) Briggs, F.N. Breeding wheats resistant to bunt by the back-cross method. Jour. Amer. Soc. Agron. 22: 239-244. 1930.
(2) Harlan, H. V., and Pope, M. N. The use and value of back-crosses in small grain breeding. Jour. Hered. 13: 319-322. 1922.
(3) Richey, F. D. The convergent improvement of selfed lines of corn. Amer. Nat. 61: 430-449. 1927.

The Australian Institute of Agricultural Science

THE JOURNAL

Since the publication of the first issue of the Institute's Journal in March several congratulatory letters have been received from editors of technical journals in Australia and overseas, expressing also the hope that exchanges might be effected. At present there are twenty journals on our exchange list, including: "Scientific Agriculture," "The Journal of the Council for Scientific and Industrial Research," "The New Zealand Journal of Science and Technology," "The Australian Veterinary Journal," "Australian Science Abstracts," "Monthly Bulletin of Agricultural Science and Practice" (issued by the International Institute of Agriculture), "The Lingnan Science Journal" (China), "The Philippine Journal of Agriculture," "Arquivos do Instituto de Biologia Vegetal" (Rio de Janeiro), the journals issued by the Agricultural Departments of New Zealand and the several States of the Commonwealth, and other agricultural organs publishd in Australia.

The Institute's Journal is also dispatched regularly to the Editors of the following publications: "Nature," "Science," "Review of Applied Mycology," "Review of Applied Entomology," "Herbage Abstracts," "Plant Breeding Abstracts," "British Chemical Abstracts," "Horticultural Abstracts," "Experiment Station Record," "Biological Abstracts," "Plant Science Literature," "Chemical Abstracts," and the leading newspapers of Australia.

Libraries receiving the Journal include: The Library, Dept. of Agriculture, Ottawa, Canada; The Library, State College of Agriculture and Mechanic Arts, Iowa; The Library, International Institute of Agriculture, Rome; Fisher Library, Sydney University; Mitchell Library, Sydney; The Library, Div. of Plant Industry, C.S.I.R., Canberra; The Library, Div. of Animal Nutrition, The University, Adelaide; the Science Library, Science Museum, South Kensington, London; and the libraries of the Agricultural Depts. of New Zealand and the several States of the Commonwealth.

The mailing list of the Journal also includes a number of subscribers: Imperial Chemical Industries Ltd. Research Station, Berks, England; Queensland Cane Growers' Council; Queensland Pastoral Supplies; Roseworthy Agricultural College, S.A.; Cresco Fertilisers, Ltd., Victoria; and others. Complimentary copies are forwarded regularly to Australia House, London, to certain scientific societies throughout Australia, and to distinguished agricultural scientists overseas.

EXECUTIVE COMMITTEE MEETING

At a meeting of the Executive Committee on 4th November the progress of the Institute in its first year was reviewed. It was reported that the membership now totalled 245, which was about twice as large as that anticipated originally. After careful consideration of the further expenses to be met this year it was felt that the Committee was now in a position to make a reimbursement to the local branches. After discussion it was finally decided that, for 1935 only, this should be at the rate of 5/6 (five shillings and sixpence) per financial member at 31st December, 1935, less the amount already

advanced to the various branches to meet petty expenses. This money will be available for the administrative and general expenses of the branches, and it is hoped that this contribution will permit a further improvement in the services available to members. On the advice of its solicitors, the Executive Committee has decided to recommend to the Federal Council that the legal incorporation of the Institute be delayed until after the first general meeting.

NEW SOUTH WALES BRANCH

The New South Wales Branch of the Institute was formed on September 27, as a separate entity from the Sydney University Agricultural Graduates' Association, which, up to that date, had been acting as the local branch. A constitution was adopted and provisional office-bearers were elected to conduct the affairs of the branch until the Annual General Meeting in February, 1936.

The constitution provides for admission to membership of the branch of:

(1) Members of the A.I.A.S. resident in New South Wales;
(2) Members of the A.I.A.S. resident outside the Commonwealth of Australia;
(3) Persons eligible for membership of the A.I.A.S., but who do not agree to become members;
(4) Persons who have been engaged primarily for at least five years in agricultural research administration, education, extension work, or any form of allied work deemed acceptable by a majority of the members present at a general meeting of the Branch.

Permanent arrangements have been made with the N.S.W. Chapter of the Roy. Aust. Institute of Architects for the use of their rooms at Science House for meetings of the local branch.

The total financial membership of the Branch is at present 78, all of whom are corporate members of the Institute. Ordinary general meetings were held in October and November. At the former, addresses were given by Mr. R. N. McCulloch on "The Present Position in Sheep Blowfly Control," and by Mr. A. W. S. Moodie on "Irrigation in the Murray Valley." The main business of the November meeting was an address by Mr. E. G. Pont, former Walter & Eliza Hall Research Fellow in Agriculture, on "Recent Developments in Dairy Research and Technology."

VICTORIAN BRANCH

JOINT MEETINGS WITH MELB. UNIV. AGRIC. SOCIETY

At the meeting on Friday, August 30, which was undergrads.' night, the two speakers were Messrs. A. R. Dick and P. F. Marriot. Mr. Dick spoke on the "Queensland Sugar Industry" and outlined the various processes involved from planting time until the production of the refined sugar. He indicated that the incidence of disease was very high in Queensland cane fields. Mr. Marriot deal with "The Relation of Forestry to Agriculture" and discussed the subject from the following aspects: (i) The use of forest land, (ii) the forest as a means of conserving and maintaining a good water supply, (iii) the prevention of erosion by forest cover, and (iv) the use of trees on the farm.

The joint meeting was fortunate in having for its speaker on the 19th October, Professor J. A. Prescott of the Waite Institute, who chose as his subject "The Principles and Practice of Soil Classification."

On 7th November, Mr. J. A. Baker addressed members on his tour through Europe and the United States. He described various points of agricultural interest seen in all countries visited, and dealt in particular with the agricultural conditions of Germany. The efforts here are directed towards making the country as self-supporting as possible. To do this the Reichnarstand was established and the functions of this body are to control marketing, conduct research and extension work. There are 50,000 village organisations, and up to 400,000 farmers' meetings have been conducted in one season. The peasant farmer, who is an integral part of the scheme, is not as primitive in his methods as one might be led to believe; in fact on one farm visited electrical machinery had been in use for the past 30 years. The prices of all agricultural products are fixed each season both to the farmer and the consumer, and in addition the farmer is given security of tenure. Exploitation of the producer is carefully guarded against. The light soils, however, which form a large part of Germany, are proving a handicap to the re-organisation scheme.

Social News.—The 12th Annual Dinner of the M.U.Ag.S. and the first combined dinner with the Victorian branch of the A.I.A.S. was held at "The Wattle" on 18th September. The President of the M.U.Ag.S., Dr. Ivan Maxwell, was in the Chair and 80 members and friends were present. Among the guests were Drs. Gerald Weigall and S. V. Sewell, Messrs. N. J. Carson of the Australian Mercantile Land and Finance Co. Ltd., J. G. McNicholl, representing the Institute of Public Administration, R. J. de C. Talbot, representing the Veterinary Association of Victoria, and C. Judd, Chairman of the Grain Elevators' Board.

SOUTH AUSTRALIAN BRANCH

The membership of the South Australian Branch has now reached a total of 47 financial corporate members, with, in addition, 3 student members. Only three people who were invited to become members refused membership. The third meeting of the Branch was held at Adelaide on 26th September, with an attendance of 23 corporate members and 2 student members. At this meeting an address was given by Mr. W. J. Spafford, Deputy-Director of Agriculture, entitled "A Tour of the Southern Hemisphere." An account of this address appears in another portion of this issue. It was decided at the September meeting that a social function in the form of a dinner, to be confined to members of the Institute, should be held during the current year. At a subsequent committee meeting it was decided that the dinner should be held at Adelaide at 8 p.m. on 6th December, 1935.

QUEENSLAND BRANCH

Three meetings of the Queensland Branch have now been held, and the support accorded to these by members and visitors augurs well for the future of the Institute in that State. At the second meeting, held at the University, Brisbane, on 13th September, Professor J. K. Murray was appointed a Vice-President of the Federal Council and Messrs. R. Veitch and A. F. Bell were appointed Branch representatives on that body. The main business of the meeting took the form of a symposium on "Pasture Improvement." The President (Professor J. K. Murray) in introducing the subject referred to the extent to which pastoral products contributed to the national wealth, and emphasised the need for a vigorous policy of pasture investigation. Other speakers included Messrs. White, Winders, Marriott, Gurney, Nixon Smith, Bryan, Wells, Blake and Soutter.

The discussion on pasture improvement problems and methods was continued at a further meeting of the Branch which was held at the University of Queensland on 8th

November. The President (Professor J. K. Murray) again occupied the chair. Mr. H. J. G. Hines, Lecturer in Agricultural Chemistry at the University of Queensland, discussed the movement and translocation of nitrogen in pasture plants, and pointed out that the frequent unpalatability of rank-growing pastures was now thought to be due to the high concentration of toxic nitrites which these contain. The cystine content of pastures in its relation to wool production was also discussed. Notes on diseases of pasture plants in Queensland were contributed by Mr. R. B. Morwood, Assistant Pathologist of the Department of Agriculture and Stock, who stated that while smuts and false smuts may sometimes reduce seeding in grass pastures they do not appear to affect the life of a pasture. Reference was also made to the toxicity of fungous parasites of pasture plants towards the grazing animal. An interesting account of the white grub problem in the paspalum pastures of the Atherton Tableland, North Queensland, was given by Mr. R. Veitch, Chief Entomologist of the Department of Agriculture and Stock, while Mr. J. Weddell, Assistant Entomologist of the same Department, discussed the grasshopper problem and gave a brief description of the life history and habits of the plague grasshopper. A general discussion followed, and the meeting concluded with supper.

TASMANIAN BRANCH

The First Annual General Meeting was held at the Hotel Metropole on 8th October, 1935, following a dinner at which members were the guests of the President. The attendance was only small, as seven members, owing to unavoidable circumstances, were unable to visit Launceston. On being nominated for re-election the President reminded members that on taking office he expressed the opinion that offices should rotate among members and he would decline nomination for the position. The elections resulted as follows: President, Mr. R. H. Bevin; Vice President, Mr. E. R. Hudson; Hon. Secretary and Treasurer, Mr. E. F. Fricke; Committee Members, Messrs. J. W. Evans and R. A. Sherwin; Sub-Editor of Journal, Dr. R. A. Scott.

Current Notes and News

AGRICULTURAL SCIENCES CLUB, SOUTH AUSTRALIA.

At the August and October meetings short technical papers and exhibits were presented; an account of these is given hereunder.

August Meeting. "The Ecology of the Plague Grasshopper," by Dr. J. Davidson. Major outbreaks of the plague grasshopper, *Chortoicetes terminifera,* were historically reviewed and it was stated that records of South Australian outbreaks prior to 1890 were not available, although these certainly occurred. No outbreak comparable with that of 1934 has occurred in the State since 1890. The field habits of the plague grasshopper were discussed and compared with those of related forms such as the brown locust of South Africa. Maps based on replies to a questionnaire and showing the distribution of grasshoppers in South Australia in 1932, 1933 and 1934 were discussed in relation to vegetation and effective rainfall as indicated by the monthly precipitation/evaporation ratio. The question of endemic areas in which grasshoppers were always present was also discussed, and in addition the relation of summer rains in the northern areas to years characterised by large numbers. In years of minimum abundance, foci remain in the endemic areas, which appear to extend northwards from the region of the 10-inch isohyet.

"A Bacterial Disease of Sweet Wines," by Mr. J. C. M. Fornachon. It was stated that under certain conditions local wines of the sweet type became unsound and developed a high acidity, due presumably to the activity of a rod-like organism, capable of flourishing

at pH 3.4 – 4.2 in these wines. A comparison was made with similar bacteria reported in wines of other countries. The local organism was tolerant of high alcoholic content and it developed only in certain wine types, of which white wines were the most susceptible. Attempts to inoculate sound wines with the bacterium had failed. Unsound wines possessed a higher pH and a higher nitrogen content. The organism was difficult to cultivate artificially and the usual media had not proved suitable. The organism had, however, been isolated and cultured, and work was proceeding with a view to the identification of the bacterium and the determination of the factors governing its development.

"Some Bone Exostoses Caused by Fluorine," by Mr. A. Peirce. The problem in this case concerned the feeding of sheep with phosphatic supplements, of which rock phosphate was the most economical. The fluorine content of certain native phosphates was a disadvantage, however, and an effort had been made to determine the toxic dose of this element for sheep. This had involved the feeding of a number of test sheep with varying amounts of fluorine in the normal food. As toxic effects are slowly manifested, a year or more being taken, two sheep were given heavy doses in order to accelerate the appearance of symptoms. These sheep remained healthy for five months but then fell into rapid decline. Bones of one of these animals were exhibited to show the types of pathological change which had occurred. A mandible showed large swellings of the bone, which could be palpated in the living animal. A femur also showed large exostoses. Analysis showed that these structures contained 1.6 – 2% F, while other parts of the skeleton of these sheep contained 0.2 – 0.4% F. The normal figure for bone is approximately 0.05% F. Other changes which occur include reduced breaking strength of the bones and pitting of the tooth enamel. Although fluorine poisoning by phosphatic licks had not yet been demonstrated in Australia, it has been recorded in the United States for cattle and pigs and in Morocco in the case of sheep.

"Remarks on a Recent Visit to Western Australia," by Prof. J. A. Prescott. An outline was given of the main features of this visit, made in July, one object of which was to discuss with the State Forestry Department certain soil problems associated with the planting of exotic soft-woods such as *Pinus radiata* and *P. pinaster*. Many plantations of these species had not grown satisfactorily and fertiliser experiments had consequently been carried out by the State Department, of which the following result is characteristic:

Mean height of trees after four years:

With no fertilizer	With 1 cwt. per ac. of blood and bone at planting in 1931.	With similar fertilizer dressing in 1933.
2.5-ft.	2.8-ft.	6.5-ft.

Older pines at Ludlow had also responded to top-dressing with phosphates. Other elements appeared to be lacking in certain localities, where no response to phosphorus could be obtained. The general question of fertilizer treatment was being studied by the State Forestry Department.

Recent developments in the work on "Wasting Disease" of calves at Denmark were outlined and reference was made to the probability of cobalt deficiency as a basic cause, as indicated by the work of Filmer and Underwood on limonite prophylaxis. A marked absence of mineral veins in the granitic base of the Denmark soils noted by the Government Geologist might have an important bearing on the incidence of the disease.

The topography and the vegetational features of certain areas of the North West division of the State which had been visited in company with Dr. L. J. H. Teakle were then described, and the widespread presence of hardpan in the mulga country of this region was mentioned.

October Meeting.

"Exchangeable Hydrogen in Soils," by Mr. C. S. Piper. The general nature of soil acidity and the various definitions of a base saturated soil were discussed. Although complete saturation with base does not occur until pH 10 – 11 is reached, for pedological purposes it was considered that Bradfield's proposal to regard soils in equilibrium with $CaCO_3$ as base saturated, was the most logical standard. Schofield's rapid para nitro phenol buffer solution method for the determination of exchangeable H to pH 7 was reviewed, and it was shown that, by using a buffer with a higher pK value (e.g., meta nitro phenol), the method could be adapted to the determination of exchangeable hydrogen in accordance with Bradfield's definition. Calcareous soils, whose major soil base was calcium, were shown to be practically in equilibrium with such a buffer, and the results obtained by the proposed method on five American soils were in close agreement with the Bradfield value. The lime requirement values (to pH7), determined by Prescott and Stephens' method, were also compared with Schofield's p.n.p. value to the same pH in the case of 72 Tasmanian soils, and a high degree of correlation was shown.

"Free Water Investigations in the Murray Valley," by Mr. A. L. Tisdall. The objectives of these investigations have been to examine existing conditions and to determine the relation of free water to irrigation and drainage. The tendency in the average vineyard has been for too much rather than too little water to have been employed, resulting in high water tables and, in the Mallee soils, a concentration of injurious salts at the soil surface. Lines of test wells at intervals across settlements indicated that free water was generally present and that rises in the water table up to seven or eight feet sometimes followed irrigation. In watering it was usually sufficient to wet only the top two or three feet of soil; further penetration was undesirable as this tended to produce linking with the water table.

"The Control of Eelworm Disease in Tomatoes," by Mr. D. B. Adam. An exhibit was provided to show that satisfactory results had been obtained by injecting eelworm infested soil (*Heterodera marioni*) from a glass-house with chloropicrin at the rate of 470-lbs. per acre. It was pointed out that this treatment had been developed in Hawaii for the control of eelworm in pineapples and it appeared possible that it would provide an equally effective but cheaper alternative to steam disinfection methods. Some trouble was experienced in applying the material but this difficulty will probably be overcome (Soil Science 40: 173).

S.U. AGRICULTURAL GRADUATES' ASSOCIATION.

The Third Annual Dinner of graduates and undergraduates of the Faculty of Agriculture, Sydney University, was held at the Hotel Metropole on Friday evening, November 8. Professor Watt presided, and there was an attendance of forty persons. Mr. G. D. Ross, Under Secretary for Agriculture, Professor J. D. Stewart, Dean of the Faculty of Veterinary Science, and Mr. E. G. Pont, the recent Walter & Eliza Hall Research Fellow in Agriculture, were present as guests. The toast of the Faculty of Agriculture, coupled with the name of Professor R. D. Watt, was proposed by Mr. Ross and replied to by Professor Watt. During the course of the evening Professor Stewart presented the Wright Cup to Mr. M. V. O'Reilly, and Dr. R. J. Noble extended a welcome home to Messrs. E. G. Pont, G de V. Davis and L. F. Mandelson—three graduates who have recently returned from abroad. On behalf of the Sydney University Agricultural Society, Professor Watt farewelled the graduands and Mr. G. de V. Davis extended a welcome on behalf of the Sydney University Agricultural Graduates' Association.

The Faculty of Agriculture Silver Jubilee Ball, which was held at the Pompadour Ballroom on Friday evening, August 30, showed a nett profit of £16/10/10, which has been donated to the Faculty for the purchase of additional books and periodicals for the library.

Personal Notes

NEW SOUTH WALES.

Mr. C. G. Savage attended the recent annual meeting of the Australian Apple and Pear Export Council in Hobart.

Mr. J. G. Churchward was recently elected hon. treasurer of the Sydney University Lecturers' Association.

Mr. F. C. McCleery visited Melbourne last month in connection with citrus fruit preservation work.

Recent visitors to the State Department included Dr. J. Davidson of the Waite Institute and Messrs. A. F. Bell of the Queensland Bureau of Sugar Experiment Stations, H. K. Lewcock and L. F. Mandelson of the Queensland Department of Agriculture.

VICTORIA.

The president of the M.U.Ag.S., Dr. Ivan Maxwell, sailed by the "Orion" on 26th November for England and the Continent. Dr. Maxwell expects to be away about nine months and intends to visit Russia, Finland and Sweden. The return trip will be made via the United States of America, China and Japan.

Mr. G. Loftus Hills, Dairy Technologist with the Victorian Department of Agriculture, has returned from a tour abroad where he visited the leading dairy research institutes of the world.

Miss Jean Dann has been appointed Bacteriologist with the Model Dairy Company, Kew, Victoria.

Mr. H. R. Dickinson has accepted the position of Assistant District Agricultural Officer with the Tasmanian Department of Agriculture. He previously was an Assistant Agrostologist with the Victorian Department.

SOUTH AUSTRALIA.

Professor J. A. Prescott, in company with Dr. B. T. Dickson, recently visited the Murrumbidgee Irrigation Areas, where soil survey work is being carried out by Messrs. J. K. Taylor and P. D. Hooper, of the Soils Division of the C.S.I.R. Discussions were also held with Mr. E. S. West and his colleagues at the Commonwealth Research Station, Griffith, N.S.W.

Dr. J. Davidson visited the pastoral areas in the neighbourhood of the Gawler Ranges of South Australia, early in September, to study the grasshopper problem in regions where the pest is endemic. More recently Dr. Davidson visited Brisbane and Sydney in connection with the banana thrips problem and entomological problems in general.

Mr. A. G. Strickland recently returned from a visit to Hobart where he attended the annual meeting of the Australian Apple and Pear Export Council and a conference of officers controlling Federal fruit export inspection.

Mr. T. J. Marshall has returned to the Waite Institute after having completed field work in the Curlwaa and Coomealla irrigation areas in New South Wales. Before leaving the latter, he was joined for a short time by Dr. A. Walkley.

Mr. D. S. Riceman has been appointed Agrostologist in the Animal Nutrition Division of the C.S.I.R. in succession to Mr. A. B. Cashmore who is now at Canberra.

Mr. C. N. Ratcliffe, Biologist, of the C.S.I.R., who is making a preliminary investigation of the problem of soil erosion, has now visited the north-western and north-eastern pastoral areas of South Australia and more recently spent some time in the regions bordering the Lake Eyre basin.

Recent visitors to the Waite Institute included His Excellency the Governor of South Australia, Sir Winston Dugan; the Commonwealth Council for Scientific and Industrial Research; the Council of the University of Adelaide; Sir Lennon Raws and Messrs. R. C. Todhunter, G. V. Hodgson, H. Newton and H. W. McGowan of Imperial Chemical Industries Ltd.; Dr. T. H. Easterfield, formerly Director of the Cawthron Institute, New Zealand; Miss Florence Austral and Mr. John Amadio; Mr. Leonard Darling, one of the donors of the John Darling Laboratory at the Waite Research Institute; General Higginson of Southern Rhodesia, Dr. Guthrie of Edinburgh and Councillor Kerr of Melbourne.

QUEENSLAND.

Mr. W. Nixon-Smith has been appointed Sales Manager of Fertiliser Distributors Pty. Ltd., Brisbane.

Mr. T. B. Paltridge, Division of Plant Industry, C.S.I.R., has been transferred from Canberra to Gatton College where he will supervise the plant introduction activities of the Division in Queensland.

Mr. L. F. Mandelson, of the Department of Agriculture and Stock, has returned from the United States where, for the past nine months, he was engaged in studying cultural and disease control aspects of the tobacco industry.

Mr. S. Marriott has been appointed Assistant Plant Breeder at the Queensland Agricultural High School and College, Gatton.

Messrs. N. E. H. Caldwell and H. K. Lewcock recently made a six weeks' tour of the southern States by car, during which they visited agricultural research institutions at Griffith, Merbein, Adelaide, Melbourne, Canberra and Sydney.

An official announcement has been made that Mr. W. A. T. Summerville, Department of Agriculture and Stock, is to leave on January 1st for a fifteen months' trip abroad, during which he will visit important agricultural and horticultural research stations throughout the world. Attention will be largely devoted to entomological problems, especially those affecting the fruit industry.

Scientists who have visited Queensland recently include Dr. J. Davidson, of the Waite Institute, and Drs. A. McTaggart and I. M. Mackerras of the C.S.I.R. staff at Canberra.

TASMANIA.

Dr. R. A. Scott, of the Agronomy Division of the Department of Agriculture, has resumed duties after three years spent in Great Britain, during which he investigated advanced experimental methods and virus and other diseases of the potato at Rothamsted and Cambridge. He secured his Ph.D. degree at Edinburgh for a thesis on "Studies on the Potato." Some years ago Dr. Scott inaugurated the potato improvement work in Tasmania—which is now a prominent feature of the Department's activity—and at present he is engaged in carrying this work a stage further.

List of Members of the Australian Institute of Agricultural Science

FEDERAL CAPITAL TERRITORY BRANCH

Allan, Frances E., M.A., Dip.Ed., Biometrician, Council for Scientific and Industrial Research, Canberra.
Allan, J. McD., B.Agr.Sc., Assistant Pathologist, C.S.I.R,, Canberra.
Angell, H. R., Ph.D., Senior Pathologist, C.S.I.R., Canberra.
Barnard, C., M.Sc., Assistant Botanist, C.S.I.R., Canberra.
Calvert, J., M.Sc., Assistant Physiologist, C.S.I.R., Canberra.
Campbell, T. G., Assistant Research Officer (Agric. Entomol.), C.S.I.R., Canberra.
Cashmore, A. B., B.Sc.Agric., Ecologist (Noxious Weeds), C.S.I.R., Canberra.
Christian, C. S., B.Sc.Agr., Assistant Geneticist, C.S.I.R., Canberra.
Currie, G. A., B.Sc., B.Sc.Agr., Senior Weeds Officer, C.S.I.R., Canberra.
Dickson, B. T., B.A., Ph.D., Chief, Div. of Plant Industry, C.S.I.R., Canberra.
Fyfe, R. V., B.Sc.Agr., Assistant Research Officer, C.S.I.R., Canberra.
Gray, S. G., B.Sc.Agr., Junior Geneticist, Research Farm, Merredin (W.A.).
Hely, F. W., B.Sc.Agr., Assistant Pathologist, C.S.I.R., Canberra.
Hill, A. V., B.Agr.Sc., Assistant Pathologist, C.S.I.R., Canberra.
Hills, K. L., B.Agr.Sc., Assistant Geneticist, C.S.I.R., Canberra.
Holdaway, F. G., M.Sc., Ph.D., Research Officer (Forest Pests), C.S.I.R., Canberra.
Kipps, E. H., B.Sc., Chemist, C.S.I.R., Canberra.
Mackerras, I. M., M.B., Ch.M., B.Sc., Principal Research Officer (Veterinary Entomology), C.S.I.R., Canberra.
Mair, H. K. C., B.Sc., Assistant Agrostologist, C.S.I.R., Canberra.
MacKinnon, E., B.A., B.Sc., A.A.I.C., Director of Plant Quarantine, Comm. Health Dept., Canberra.
McMillan, J. R. A., M.Sc., B.Sc.Agr., Senior Geneticist, C.S.I.R., Canberra.
McTaggart, A., M.S.A., Ph.D., Senior Research Officer (Introduction and Agrostology), C.S.I.R., Canberra.
Nicholson, A. J., D.Sc., Acting Chief, Div. of Econ. Entomology, C.S.I.R., Canberra.
Paltridge, T. B., B.Sc., Assistant Agrostologist, C.S.I.R., Canberra.
Smith, H. F., M.S.A., B.Sc. (Agr.), Assistant Geneticist, C.S.I.R., Canberra.

NEW SOUTH WALES BRANCH

Allman, S. L., M.Sc., B.Sc.Agr., Assistant Entomologist, Dept. of Agriculture, Sydney.
Anderson, R. H., B.Sc.Agr., Senior Assistant Botanist, Botanic Gardens, Sydney.
Atkinson, W. T., B.Sc.Agr., Assistant Plant Breeder, Dept. of Agriculture, Sydney.
Baber, E. C., Assistant Plant Pathologist, C.S.R. Co., Broadwater, Richmond River.
Baker, R. T., Ex-Curator, Technological Museum, Sydney.
Barrett, J. N., B.Agr.Sc., Farmer, "Yera," Edgeroi, N.S.W.
Benjamin, M. S., D.I.C., First Analyst, Dept. of Agriculture, Sydney.
Bentivoglio, S. E., B.Sc.Agr., Technologist, Tooth and Co., Sydney.
Birmingham, W. A., Assistant Biologist, Dept. of Agriculture, Sydney.
Bowman, F. T., B.Sc.Agr., Fruit Research Officer, Dept. of Agriculture, Sydney.
Breakwell, E., B.A., B.Sc., Inspector of Schools and Supervisor of Agriculture, Dept. of Education, Sydney.
Brown, H. P., B.Sc.Agr., Assistant Biologist, Dept. of Agriculture, Sydney.
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Chadwick, S. W., B.Sc.Agr., School Teacher, Dept. of Education, Sydney.
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Clarke, H. F., Colonial Sugar Refining Co., O'Connell Street, Sydney.
Cross, D. O., B.Sc.Agr., Assistant Botanist, Dept. of Agriculture, Sydney.
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Leech, W. D., M.A., Director, Australian Food Research Laboratories, Cooranbong.
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West, E. S., M.Sc., Officer-in-Charge, Comm. Research Station, Griffith.
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Wilson, L. J., B.Sc.Agr., Assistant Analyst, Dept. of Agriculture, Sydney.
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Woodhill, A. R., B.Sc.Agr., Lecturer in Entomology, The University, Sydney.
Wright, G., H.D.A., Lecturer in Chemistry and Bacteriology, Faculty of Agriculture, The University, Sydney.
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Zeck, E. H., Assistant Entomologist, Dept. of Agriculture, Sydney.

VICTORIAN BRANCH

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Beruldsen, E. T., B.Sc. (Agric.), Senior Irrigation Officer, Dept. of Agriculture, Melbourne.
Blair, G. N., B.Agr.Sc., Technologist (Tobacco), Carreras Ltd., Melbourne.
Boyle, R. C., M.Sc., Advisory Officer, Nitrogen Fertilisers Pty. Ltd., Sydney, N.S.W.
Brake, J., B.Agr.Sc., Agricultural Superintendent, Dept. of Agriculture, Melbourne.
Cannon, M. J., B.Agr.Sc., Tobacco Research Officer, Dept. of Agriculture, Melbourne.
Castella, F. de, Viticulturist, Dept. of Agriculture, Melbourne.
Cole, C. E., B.Agr.Sc., Assistant Horticultural Research Officer, Department of Agriculture, Melbourne.
Crawford, F. S., M.Agr.Sc., Assistant Publicity Supervisor, Dept. of Agriculture, Melbourne.
Dickinson, H. R., B.Agr.Sc., Assistant Agrostologist, Dept. of Agriculture, Melbourne.
Doery, A. C., B.Agr.Sc., Science Field Officer, Dept. of Agriculture, Melbourne.
Dreverman, A. C., Principal, Dookie Agricultural College, Victoria.
Fish, S., M.Agr.Sc., Biologist, Department of Agriculture, Melbourne.
Forster, H. C., M.Agr.Sc., Inspector of Agriculture, Dept. of Agriculture, Melbourne.
Fowler, R. H., B.Agr.Sc., Assistant Research Officer, Department of Agriculture, Melbourne.
Freedman, J. R., B.Agr.Sc., Assistant Research Officer, Dept. of Agriculture, Melbourne.
Geddes, H. J., M.Agr.Sc., Journalist, "Weekly Times" Ltd., Melbourne.
Gepp, O. H., B.Agr.Sc., Advisory Officer, Nitrogen Fertilisers Pty. Ltd., Melbourne.
Gillespie, J. L., B.Agr.Sc., Agricultural Scientist, H. V. McKay Massey Harris Pty. Ltd., Melbourne.
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Hackwell, A. B., B.Agr.Sc., Agricultural Instructor, Department of Agriculture, Melbourne.
Hewitt, A. C. T., M.Agr.Sc., Dairy Herd Manager, State Research Farm, Werribee.
Jessep, A. W., M.Agr.Sc., B.Sc., Dip.Ed., Principal, School of Primary Agriculture, Burnley, Melbourne.
Johnston, C. J. R., B.Agr.Sc., Field Officer, Department of Agriculture, Melbourne.
Kennedy, J. F., B.Agr.Sc., Pastoral Research Officer, Australian Estates and Mortgage Co. Pty. Ltd., Melbourne.
King, F. E., B.Agr.Sc., Industrial Chemist, Shell Co. of Australia Ltd., Melbourne.
Lee, A. A., B.Agr.Sc., Cereal Experimentalist, Dept. of Agriculture, Melbourne.
Leeper, G. W., M.Sc., Lecturer in Agricultural Chemistry, University of Melbourne.
Levick, G. T., B.Agr.Sc., Science Master, Dookie Agricultural College, Victoria.
Lyon, A. V., M.Agr.Sc., Officer in Charge, Commonwealth Research Station, Merbein.
Maxwell, L. A. I., M.Sc., B.Agr.Sc., M.D., B.S., Senior Lecturer in Physiology, University of Melbourne.
Meares, A. D., B.Agr.Sc., Medical Student, University of Melbourne.

Miller, W. B., M.Agr.Sc., Senior Inspector of Agriculture, Department of Agriculture, Melbourne.
Millikan, C. R., M.Agr.Sc., Assistant Plant Pathologist, Department of Agriculture, Melbourne.
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Penman, F., M.Sc., A.A.C.I., Assistant Research Chemist, Department of Agriculture, Melbourne.
Pescott, R. T. M., M.Agr.Sc., Entomologist, Department of Agriculture, Melbourne.
Provan, J. L., B.Agr.Sc., Horticultural Research Officer, Department of Agriculture, Melbourne.
Pugsley, A. T., B.Agr.Sc., Assistant Plant Pathologist, Department of Agriculture, Melbourne.
Rae, F. J., B.A., B.Sc., B.Agr.Sc., Director, Botanic Gardens (also Government Botanist), Melbourne.
Raff, Miss J., M.Sc., Lecturer in Agricultural Entomology, University of Melbourne.
Read, F. M., M.Agr.Sc., Chief Inspector of Horticulture, Department of Agriculture, Melbourne.
Rivett, Sir A. C. David, K.C.M.G., M.A., D.Sc., Deputy Chairman and Chief Executive Officer, Council for Scientific and Industrial Research, Melbourne.
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Sims, H. J., B.Agr.Sc., Science Field Officer, Dept. of Agriculture, Melbourne.
Sly, A. H., B.Agr.Sc., Chemist, Beet Sugar Factory, Maffra.
Smith, A. C., B.Agr.Sc., Assistant Cheese Expert, Dept. of Agriculture, Melbourne.
Tindale, G. B., B.Agr.Sc., Cool Storage Research Officer, Dept. of Agriculture, Melbourne.
Tisdall, A. L., B.Agr.Sc., Assistant Research Officer, Commonwealth Research Station, Merbein.
Twentyman, R. L., B.Agr.Sc., Agrostologist, Dept. of Agriculture, Melbourne.
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Vasey, G. H., B.C.E., Lecturer in Agricultural Engineering, University of Melbourne.
Wadham, S. M., M.A. (Cantab. and Melb.), Agr.Dip.(Cantab.), Professor of Agriculture, University of Melbourne.
Walters, D. B., B.Agr.Sc., Assistant Research Officer, Commonwealth Research Station, Merbein.
Ward, J. M., Superintendent of Horticulture, Dept. of Agriculture, Melbourne.
Wark, D. C., B.Agr.Sc. (Post Graduate Research), University of Melbourne.
Webb, W. J., B.Sc.Agr., Science Master, Dookie Agricultural College, Vic.
Wilson, H. C., Manager, State Research Farm, Werribee.
Woodgate, G. B., B.A., Dip.Ed., Principal, Longerenong Agricultural College, Victoria.

STUDENT MEMBERS.—Aitken, Miss Y.; Blackburn, G.; Dick, A. R.; Downes, R. G.; Edmonds, A. G.; Hayman, R. H.; Kneen, T. H.; Major, W. C. T.; Marriott, P. F.; Newman, F. S. J.; Ryland, J. P.; Swaby, R. J.

SOUTH AUSTRALIAN BRANCH

Adam, D. B., B.Agr.Sc., Plant Pathologist, Waite Agricultural Research Institute. Adelaide.
Andrewartha, H. G., M.Agr.Sc., Entomologist (Council for Scientific and Industrial Research), stationed at Waite Institute, Adelaide.
Angus, W. A., B.Sc., Scotch College, Mitcham.
Barlow, H. B., H.D.A., Chief Dairy Instructor, Department of Agriculture, Adelaide.
Best, R. J., M.Sc., Chemist, Waite Agricultural Research Institute, Adelaide.
Breakwell, E. J., B.Sc.Agr., Plant Breeder, Agricultural College, Roseworthy.
Callaghan, A. R., B.Sc., B.Sc.Agr., D.Phil., Principal, Agricultural College, Roseworthy.
Clarke, G. H. F., B.Sc., Botanist, Agricultural College, Roseworthy
Cook, L. J., R.D.A., Manager, Experimental Farm, Kybybolite.
Colquhoun, T. T., M.Sc., Assistant Plant Pathologist, Waite Agricultural Research Institute, Adelaide.

Cornish, E. A., B.Agr.Sc., Assistant Agrostologist, Waite Agricultural Research Institute, Adelaide.

Cowan, L. J., B.Sc., Pastoralist, Blakiston.

Davidson, J., D.Sc., Head, Department of Entomology, Waite Agricultural Research Institute, Adelaide.

Davies, J. G., B.Sc., Ph.D., Agrostologist, Waite Agricultural Research Institute, Adelaide.

Donald, C. M., B.Sc.Agr., Agronomist (Council for Scientific and Industrial Research), stationed at Waite Institute, Adelaide.

Elliott, K. A., B.Agr.Sc., Higher Primary School, Orroroo.

Fornachon, J. C. M., B.Agr.Sc., Investigator in Wine Bacteriology, c/o Waite Institute, Adelaide.

Gallus, H. P. C., M.Sc., Assistant Chemist, Waite Agricultural Institute, Adelaide.

Gurney, H. C., M.Sc., Agronomist (Nitrogen Investigations), Waite Agricultural Research Institute, Adelaide.

Herriot, R. J., B.Agr.Sc., High School, Balaklava.

Hooper, P. D., Assistant Soil Surveyor, Soils Division, Council for Scientific and Industrial Research, Waite Institute, Adelaide.

Hosking, J. S., M.Sc., A.I.C., Chemist, Soils Division, Council for Scientific and Industrial Research, Waite Institute, Adelaide.

Hubble, G. D., B.Agr.Sc., Assistant Agronomist, Waite Agricultural Research Institute, Adelaide.

Hutton, E. M., B.Agr.Sc., Field Officer, Department of Agriculture, Adelaide.

Jefferis, A. T., B.Sc., Pastoralist, Willunga.

Kemp, H. K., B.Agr.Sc. (Hons.), c/o Kemp's Nurseries, Kingswood.

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Phipps, I. F., M.Sc., B.Agr.Sc., Ph.D., Plant Geneticist, Waite Agricultural Research Institute, Adelaide.

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STUDENT MEMBERS.—Close, S. M.; Goode, J. R.; Hooper, F. H.

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Kent, O. St. J., B.Sc., Dairy Bacteriologist, Dept. of Agriculture and Stock, Brisbane.
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(Names of persons who joined the Institute subsequent to the preparation of the above list, will be published in the March, 1936, issue of the Journal.—Ed.)